Attachment A
LACFCD Service Area

Los Angeles County Flood Control District (LACFCD) Background Information

In 1915, the Los Angeles County Flood Control Act established the LACFCD and empowered it to manage flood risk and conserve stormwater for groundwater recharge. In coordination with the United States Army Corps of Engineers, the LACFCD developed and constructed a comprehensive system that provides for the regulation and control of flood waters through the use of reservoirs and flood channels. The system also controls debris, collects surface stormwater from streets, and replenishes groundwater with stormwater and imported and recycled waters. The LACFCD covers the 2,753 square-mile portion of Los Angeles County south of the east-west projection of Avenue S, excluding Catalina Island. It is a special district governed by the County of Los Angeles Board of Supervisors, and its functions are carried out by the Los Angeles County Department of Public Works. The LACFCD service area is shown in **Figure A-1.**

Unlike cities and counties, the LACFCD does not own or operate any municipal sanitary sewer systems, public streets, roads, or highways. The LACFCD operates and maintains storm drains and other appurtenant drainage infrastructure within its service area. The LACFCD has no planning, zoning, development permitting, or other land use authority within its service area. The permittees that have such land use authority are responsible under the MS4 Permit for inspecting and controlling pollutants from industrial and commercial facilities, development projects, and development construction sites. (Permit, Part II.E, p. 17.)

The MS4 Permit language clarifies the unique role of the LACFCD in stormwater management programs: "[g]iven the LACFCD's limited land use authority, it is appropriate for the LACFCD to have a separate and uniquely-tailored stormwater management program. Accordingly, the stormwater management program minimum control measures imposed on the LACFCD in Part VI.D of this Order differ in some ways from the minimum control measures imposed on other Permittees. Namely, aside from its own properties and facilities, the LACFCD is not subject to the Industrial/Commercial Facilities Program, the Planning and Land Development Program, and the Development Construction Program. However, as a discharger of storm and non-stormwater, the LACFCD remains subject to the Public Information and Participation Program and the Illicit Connections and Illicit Discharges Elimination Program. Further, as the owner and operator of certain properties, facilities and infrastructure, the LACFCD remains subject to requirements of a Public Agency Activities Program." (Permit, Part II.F**,** p. 18.)

Consistent with the role and responsibilities of the LACFCD under the Permit, the EWMPs and CIMPs reflect the opportunities that are available for the LACFCD to collaborate with permittees having land use authority over the subject watershed area. In some instances, the opportunities are minimal; however, the LACFCD remains responsible for compliance with certain aspects of the MS4 permit as discussed above.

During the development of the CIMP, LACFCD infrastructure was evaluated for monitoring opportunities within the EWMP area shown in **Figure A-2**. The LACFCD will be collaborating with the groups for all of the monitoring.

Figure A-1. Los Angeles County Flood Control District Service Area

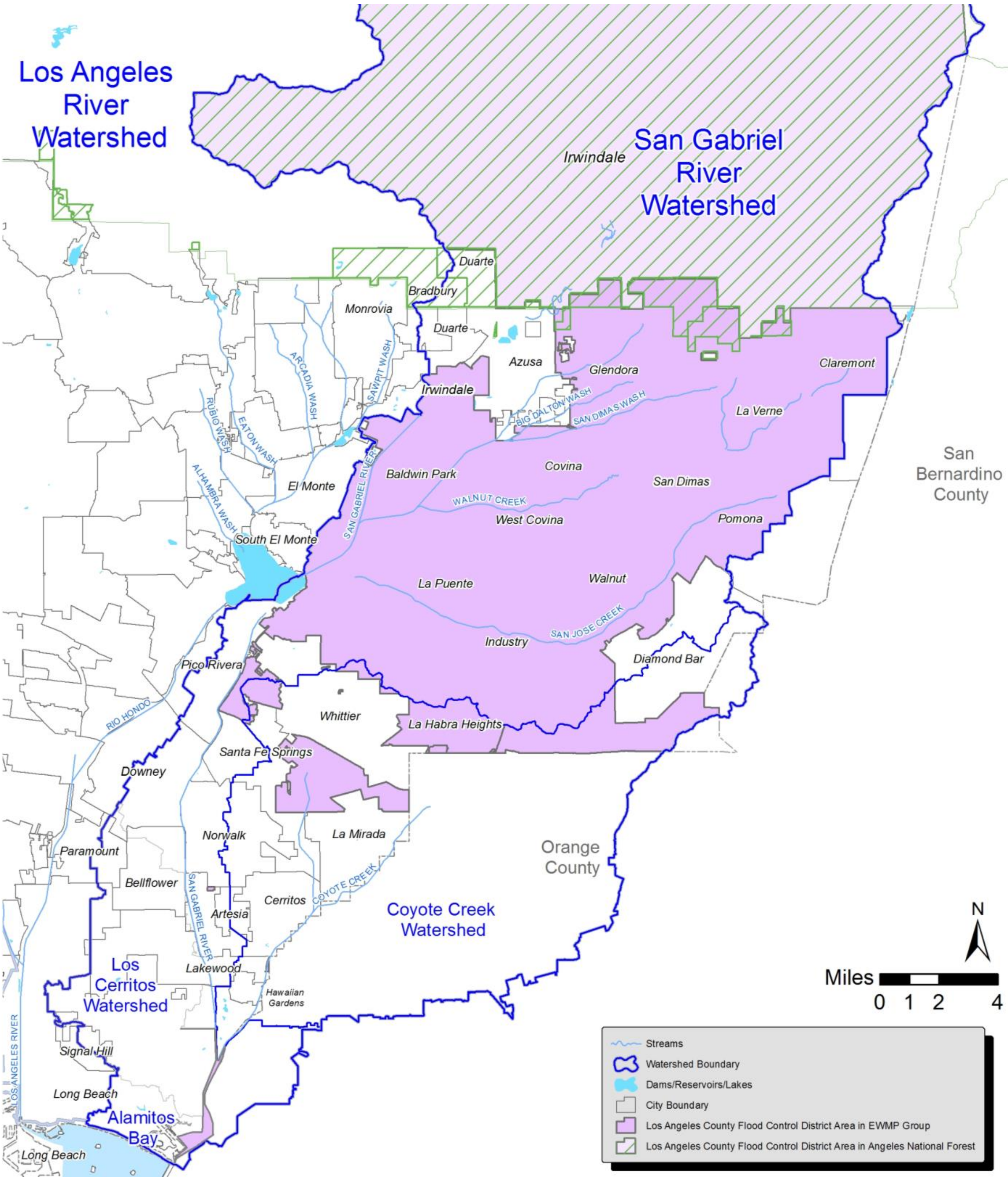


Figure A-2. Los Angeles County Flood Control District Area in USGR EWMP Group

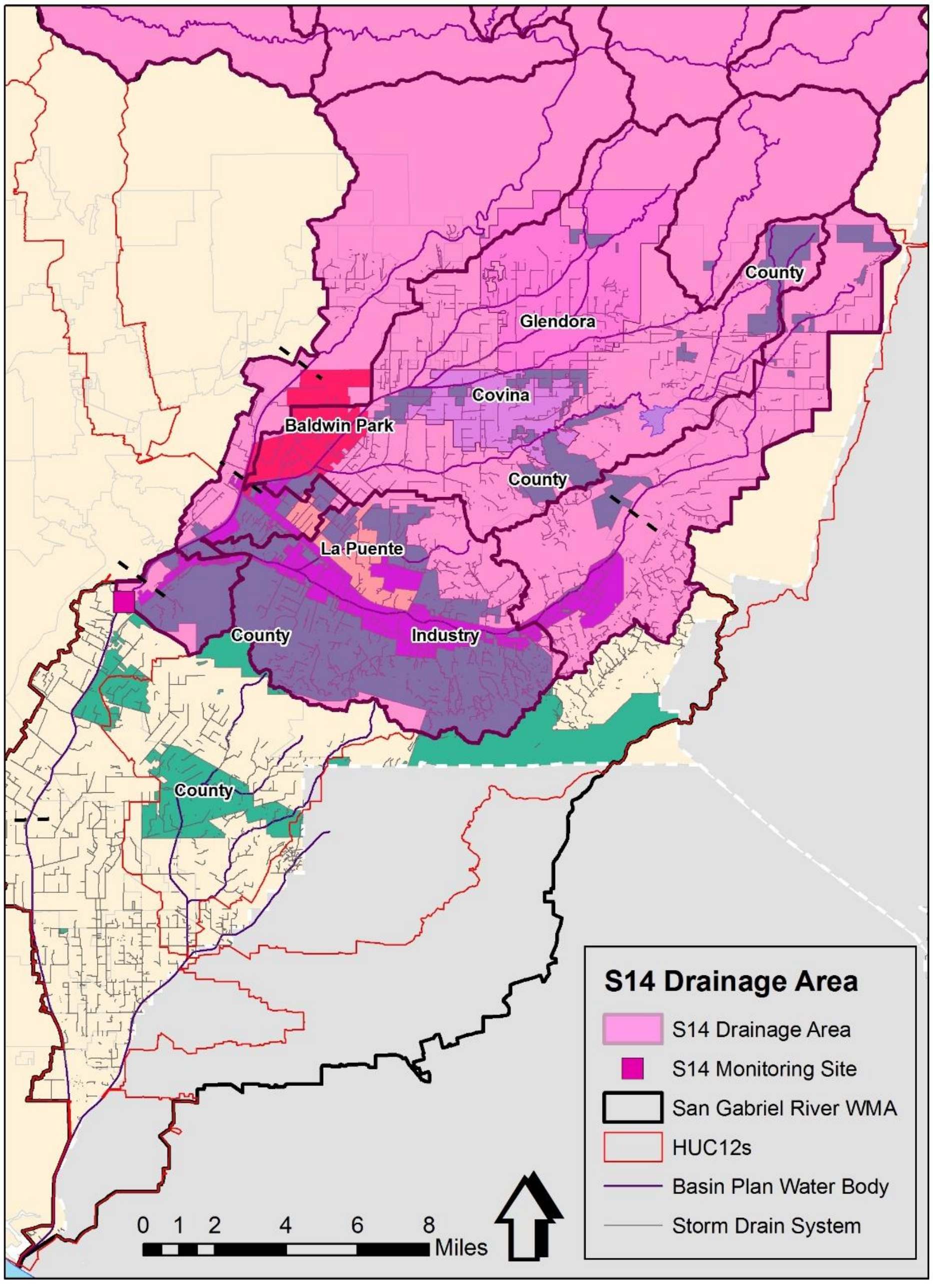
Attachment B
Monitoring Location Fact Sheets

B-1 RECEIVING WATER SITES

B-1.1 San Gabriel River Long-Term Assessment Site

Waterbody Name	Waterbody Type	Site ID	Historical Site ID	Site Type	Latitude	Longitude
SGR Reach 3	Main Stem	S14	MS4 ME S14	LTA and TMDL	34.01277	-118.06381

General Description: LTA monitoring site located at a historic stream gage station below San Gabriel River Parkway in Pico Rivera. This monitoring site is a historic and current MS4 Mass Emission Station. Although this monitoring site is located in SGR Reach 2, it is located near the terminus of SGR Reach 3 and is representative of the conditions within SGR Reach 3.



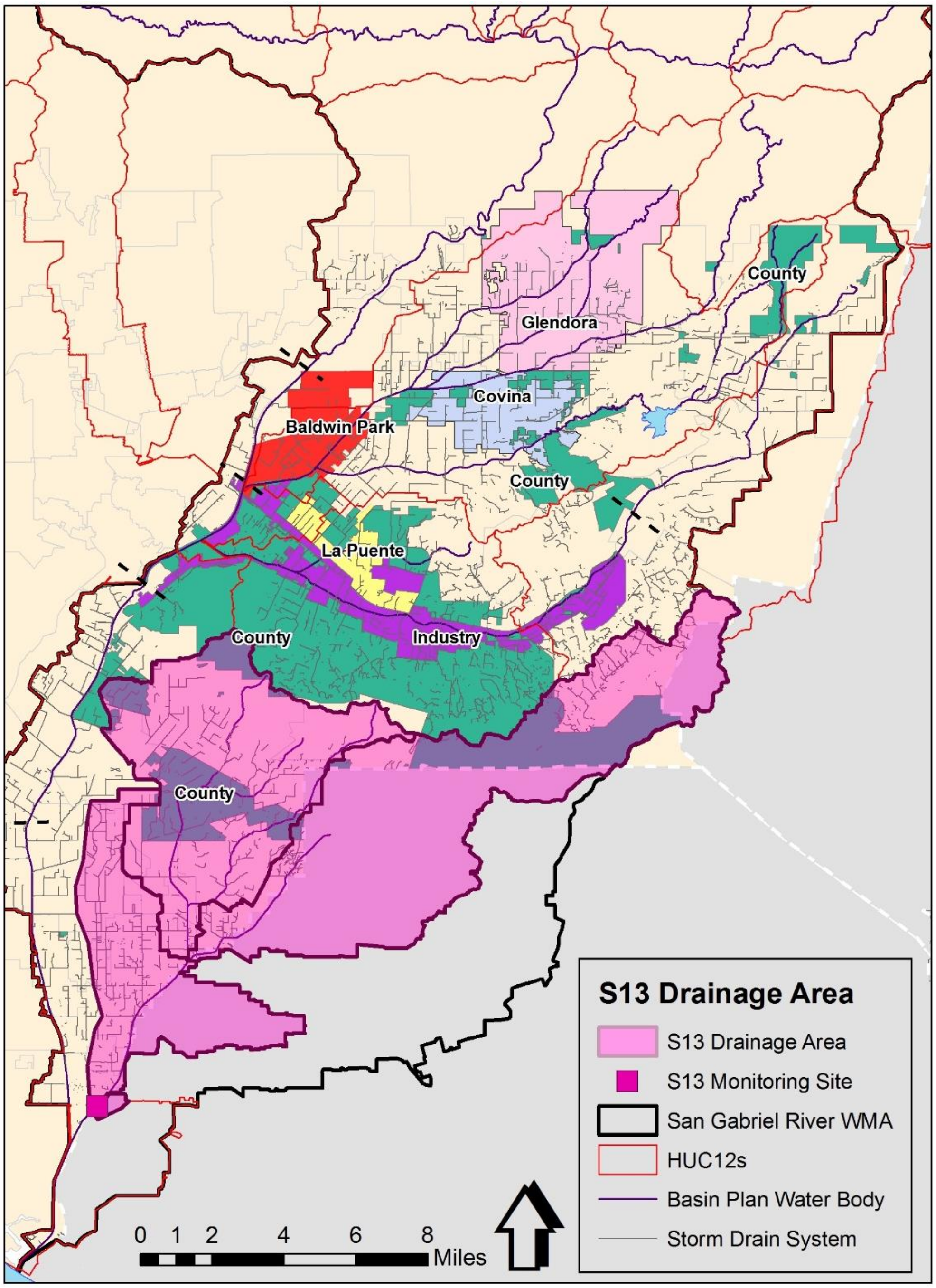
S14 Aerial View

S14 Looking Downstream

B-1.2 Coyote Creek Long-Term Assessment Site

Waterbody Name	Waterbody Type	Site ID	Historical Site ID	Site Type	Latitude	Longitude
Coyote Creek	Tributary	S13	MS4 ME S13	LTA and TMDL	33.80982	-118.07671

General Description: This monitoring location is situated at an existing Army Corps of Engineers stream gage below Spring Street in the lower San Gabriel River WMA. This is a historic and current MS4 ME station. The LSGR WMP Group will coordinate the monitoring with LACFCD.



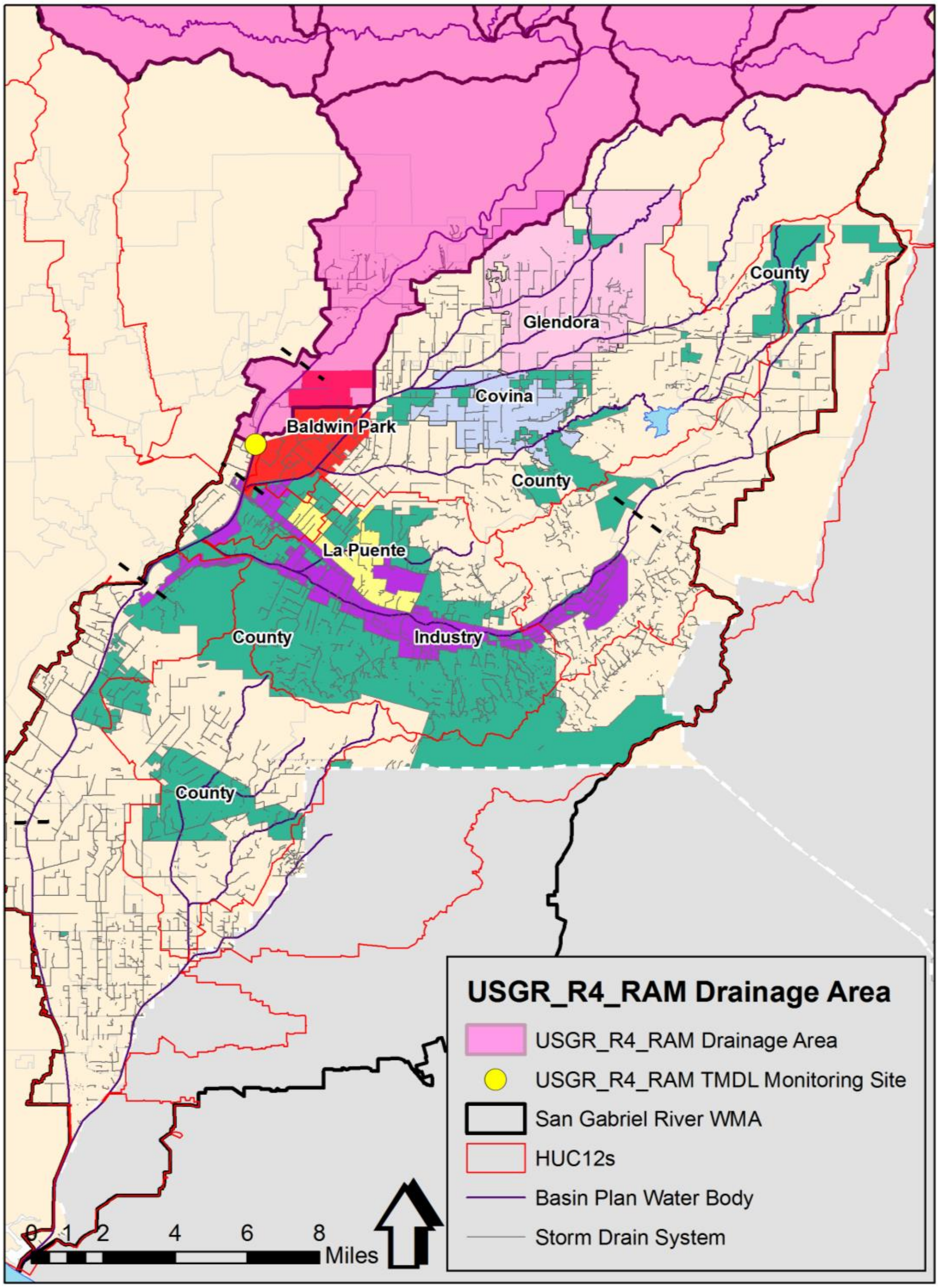
S13 Aerial View

S13 Looking Downstream

B-1.3 San Gabriel River Reach 4 TMDL Site

Waterbody Name	Waterbody Type	Site ID	Historical Site ID	Site Type	Latitude	Longitude
SGR Reach 4	Main Stem	USGR_R4_RAM	N/A	TMDL	34.07714	-118.00045

General Description: TMDL monitoring site located in San Gabriel River Reach 4 at Ramona Boulevard.



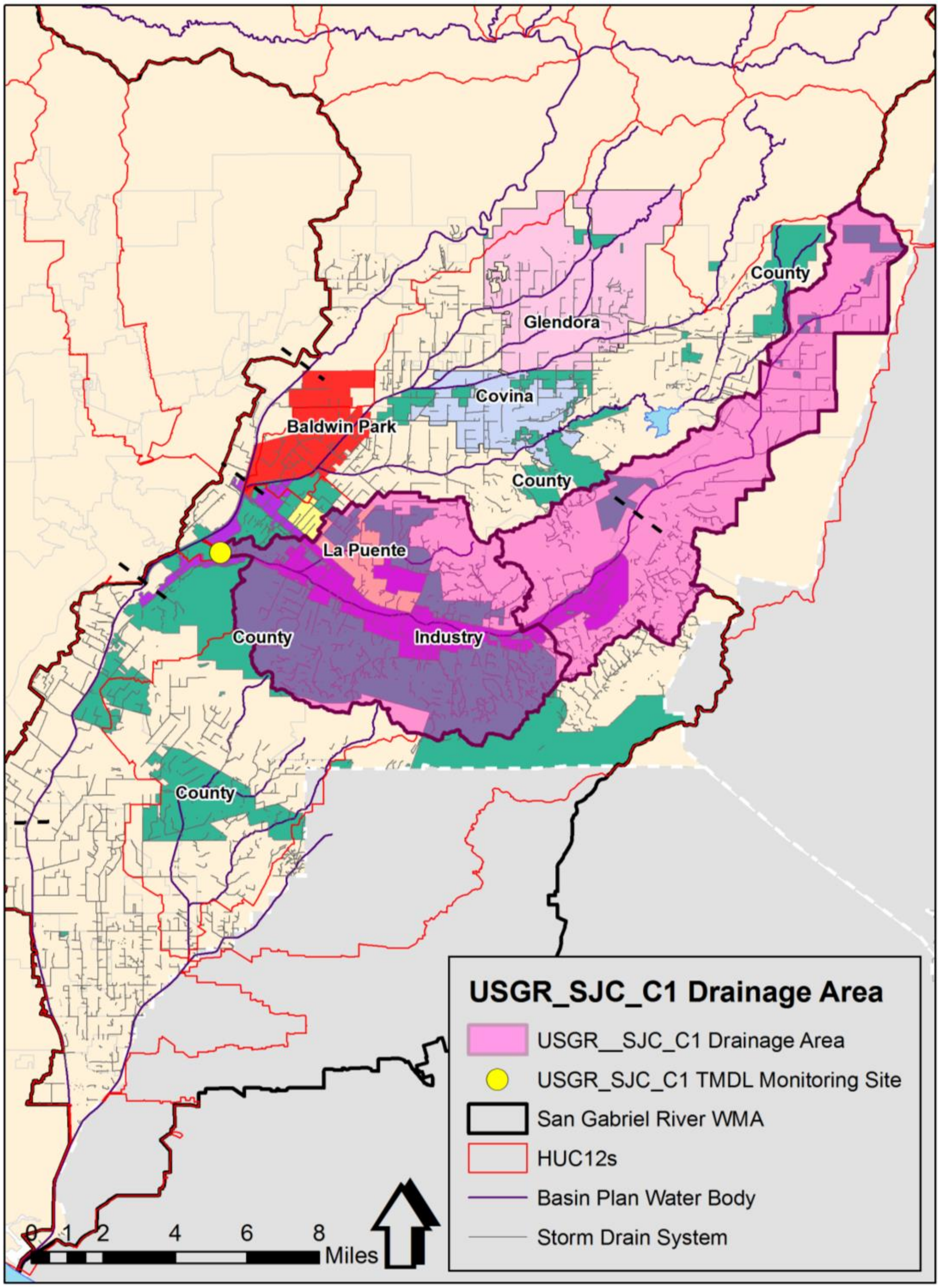
USGR_R4_RAM Aerial View

USGR_R4_RAM Looking Upstream

B-1.4 San Jose Creek Reach 1 TMDL Site

Waterbody Name	Waterbody Type	Site ID	Historical Site ID	Site Type	Latitude	Longitude
SJC Reach 1	Tributary	USGR_SJC_C-1	LACSD C-1	TMDL	34.03339	-118.01764

General Description: TMDL monitoring site located in San Jose Creek and is situated upstream of the San Jose Creek WRP discharges. The LACSD has historically monitored this site.



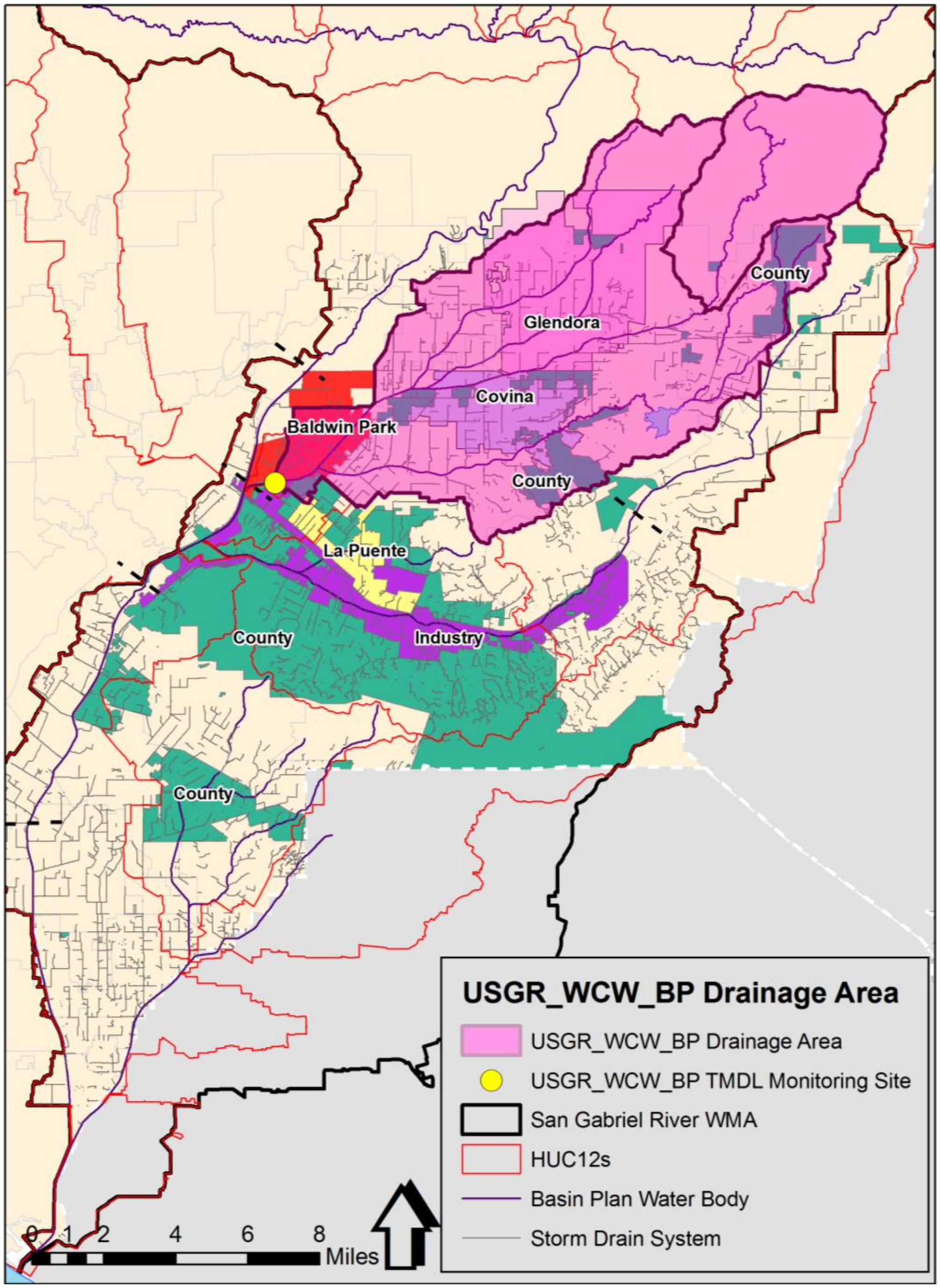
USGR_SJC_C-1 Aerial View

USGR_SJC_C-1 Looking Upstream

B-1.5 Walnut Creek TMDL Site

Waterbody Name	Waterbody Type	Site ID	Historical Site ID	Site Type	Latitude	Longitude
Walnut Creek Wash	Tributary	USGR_WCW_BP	LACDPW SGLT506	TMDL	34.06173	-117.99129

General Description: TMDL monitoring site located in the unlined portion of Walnut Creek just upstream of the confluence with the San Gabriel River. The LACDPW has historically monitored at this location under the SGRRMP.

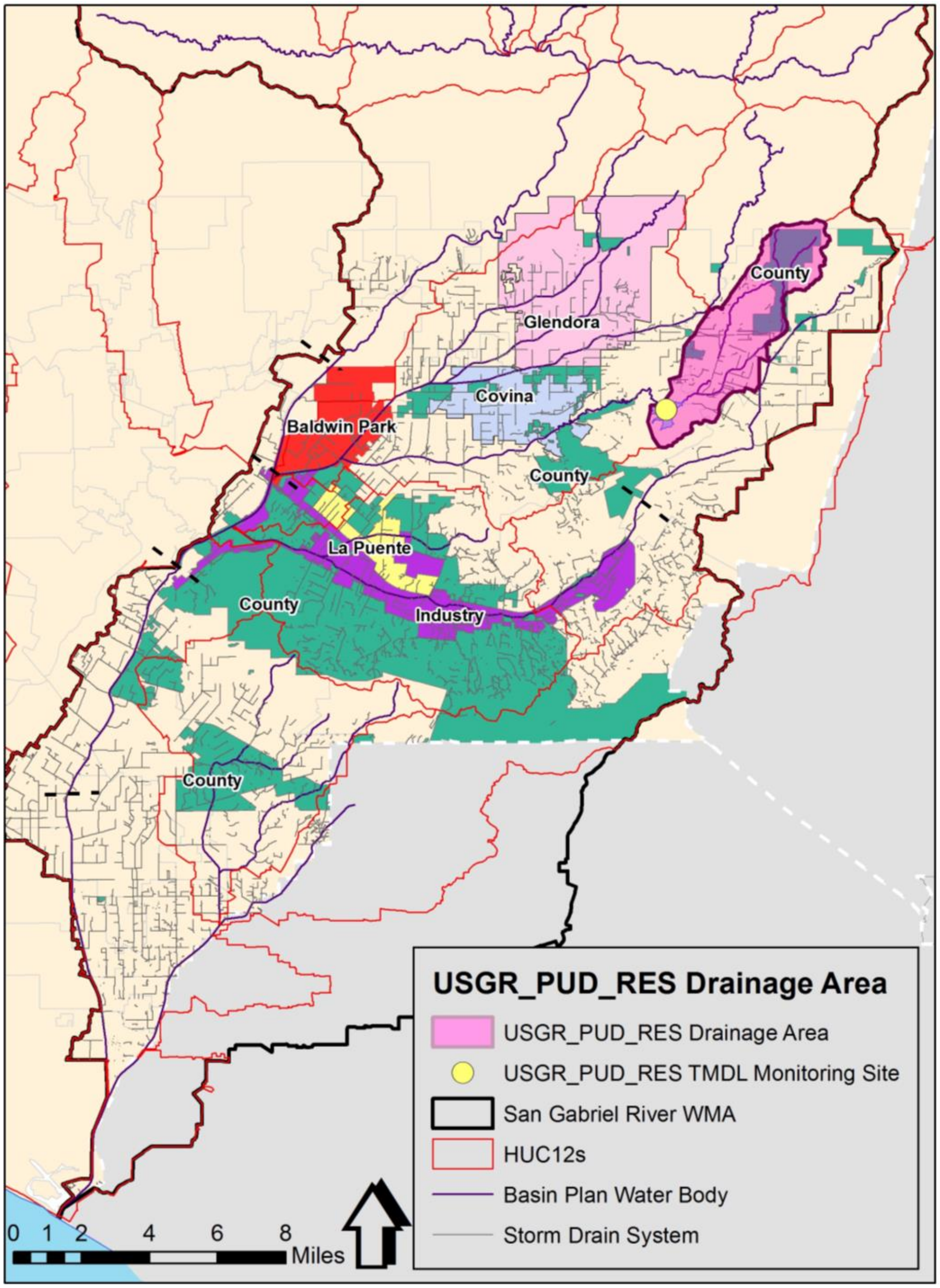


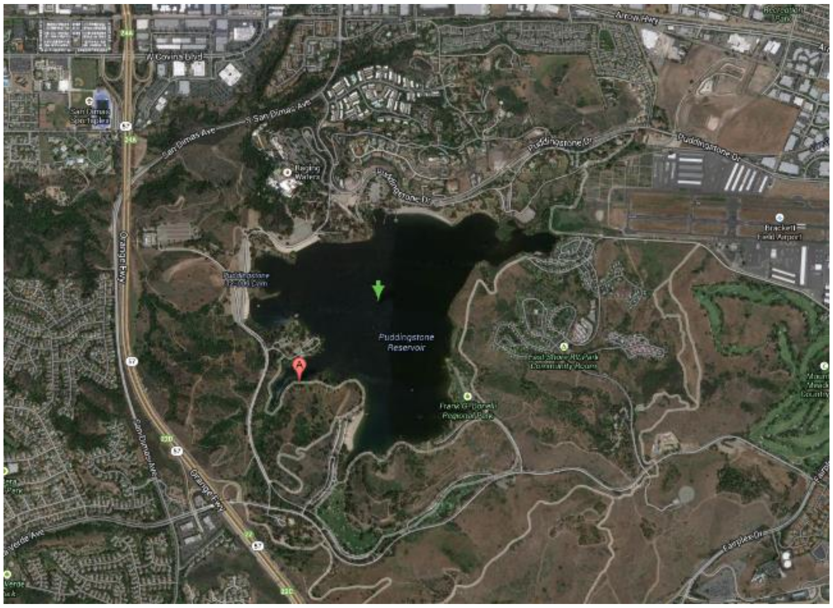
USGR_WCW_BP Aerial View

USGR_WCW_BP Looking Upstream

B-1.6 Puddingstone Reservoir TMDL Site

Waterbody Name	Waterbody Type	Site ID	Historical Site ID	Site Type	Latitude	Longitude
Pudding-stone Reservoir	Lake	USGR_PUD_RES	Various	TMDL	34.085689	-117.803300
General Description: The monitoring site will be located at the center of Puddingstone Reservoir. The exact location of the monitoring site may vary due to hydrologic conditions affecting reservoir levels. Fish sample collection may require locations dependent on species of fish (Largemouth bass for mercury and common carp for OC pesticide and PCBs)						





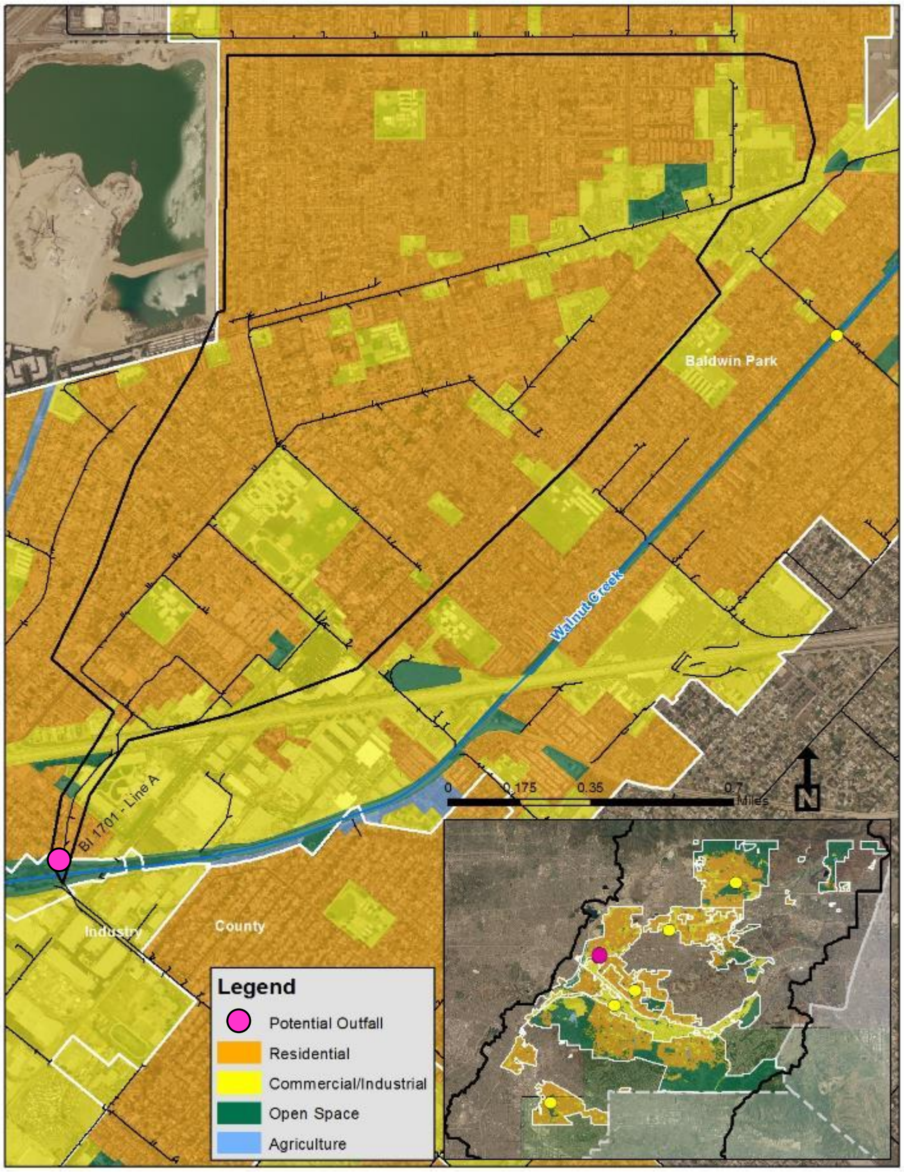
USGR_PUD_RES Aerial View

B-2 SELECTED STORMWATER OUTFALL SITES

B-2.1 BI 1701 - Line A

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Walnut Creek Wash	Baldwin Park	BI 1701 -Line A	126 inches	SW Outfall	34.062694	-117.988920

General Description: New SW outfall monitoring site discharging to Walnut Creek Wash downstream of Baldwin Park Blvd.



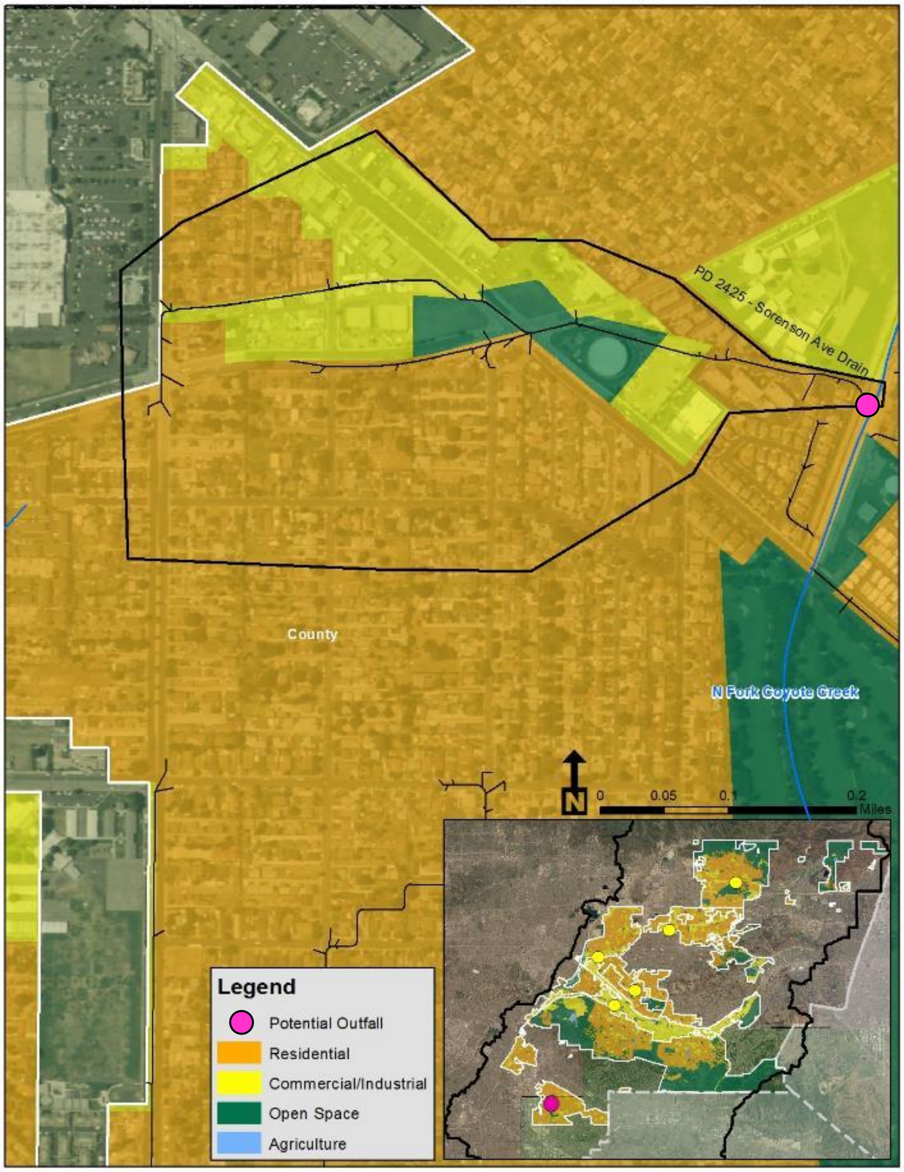
BI 1701 - Line A Aerial View

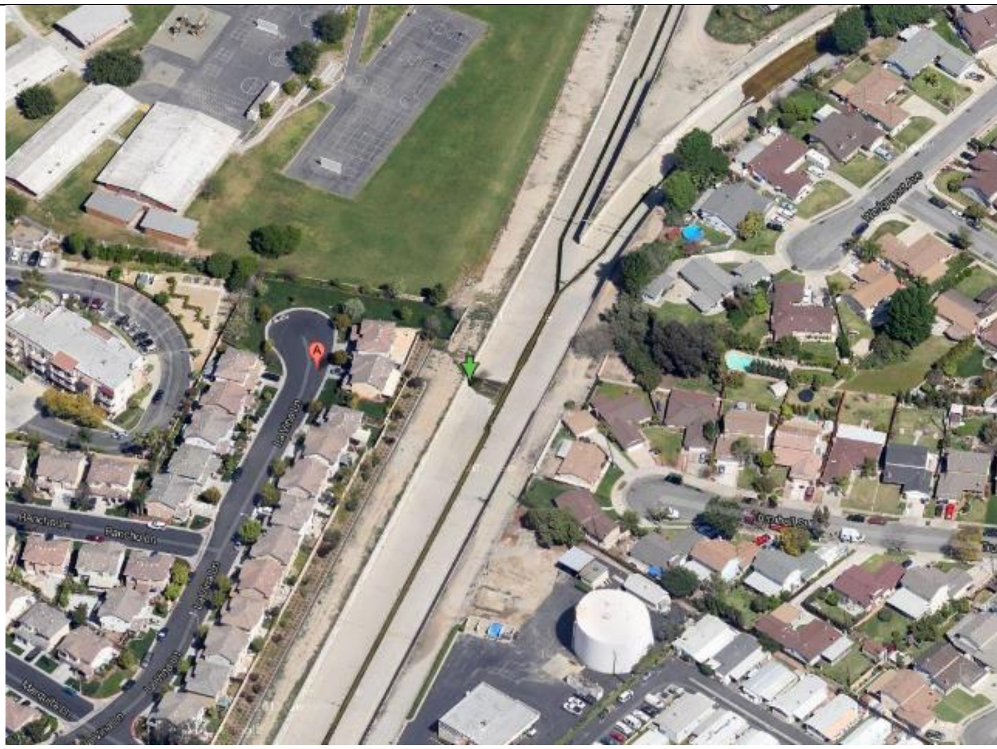
BI 1701 - Line A

B-2.2 PD 2425 –Sorenson Ave Drain

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
North Fork Coyote Creek	County	PD 2425 – Sorenson Ave Drain	36 inches	SW Outfall	33.936115	-118.036951

General Description: New SW outfall monitoring site discharging to North Fork Coyote Creek upstream of Telegraph Rd.



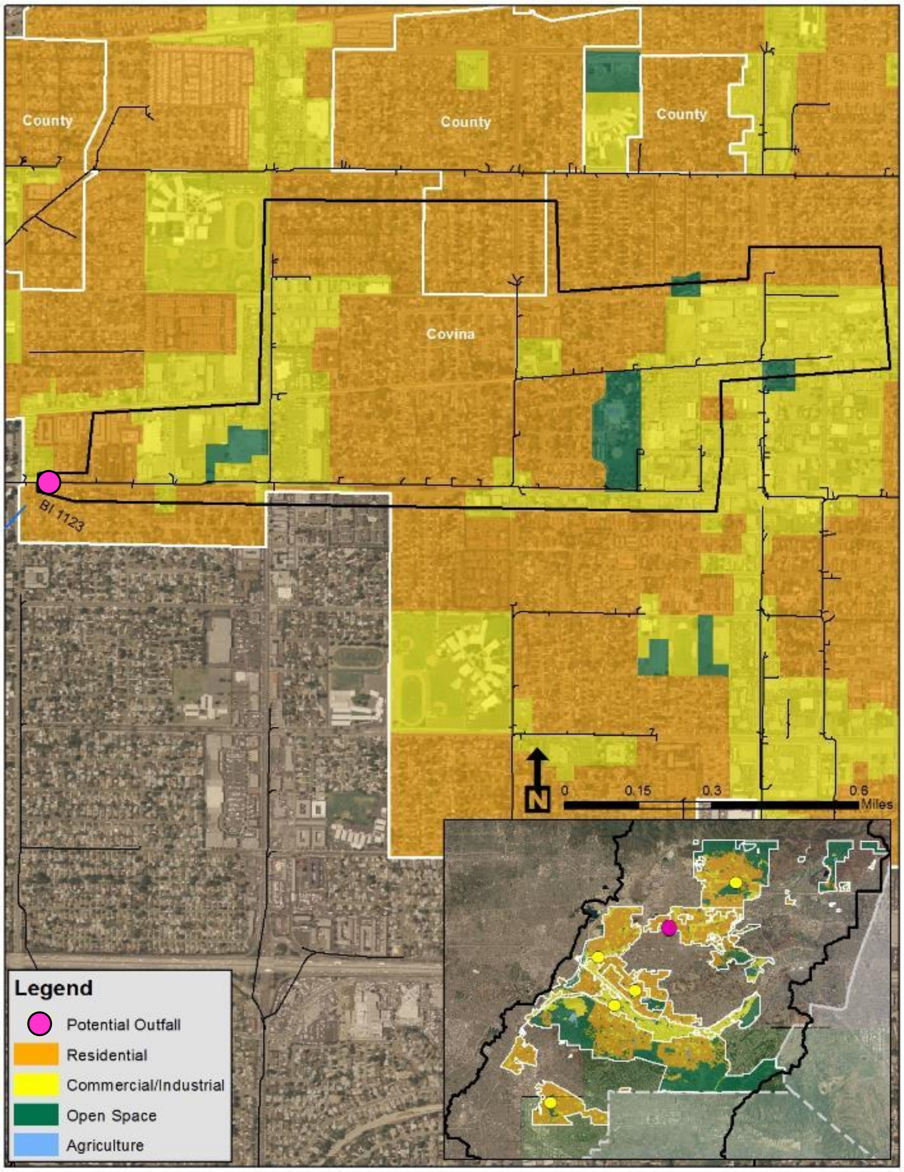


PD 2425 –Sorenson Ave Drain Aerial View

PD 2425 –Sorenson Ave Drain

B-2.3 BI 1123

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Big Dalton Wash	Covina	BI 1123	81 inches	SW Outfall	34.086451	-117.915529
General Description: New SW outfall monitoring site discharging to Big Dalton Wash. Located on W Badillo St east of N Lark Ellen Ave at nearest manhole upstream of city boundary.						



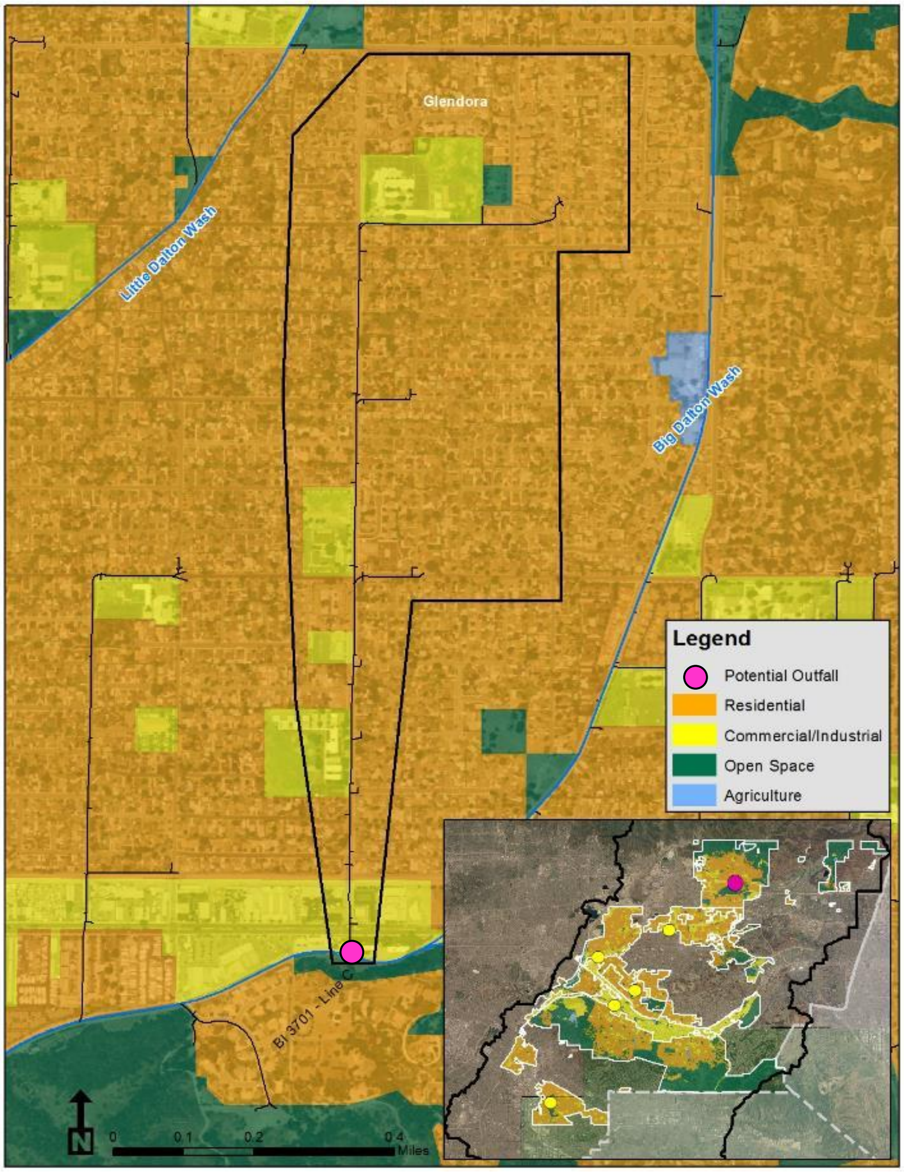
BI 1123 Aerial View

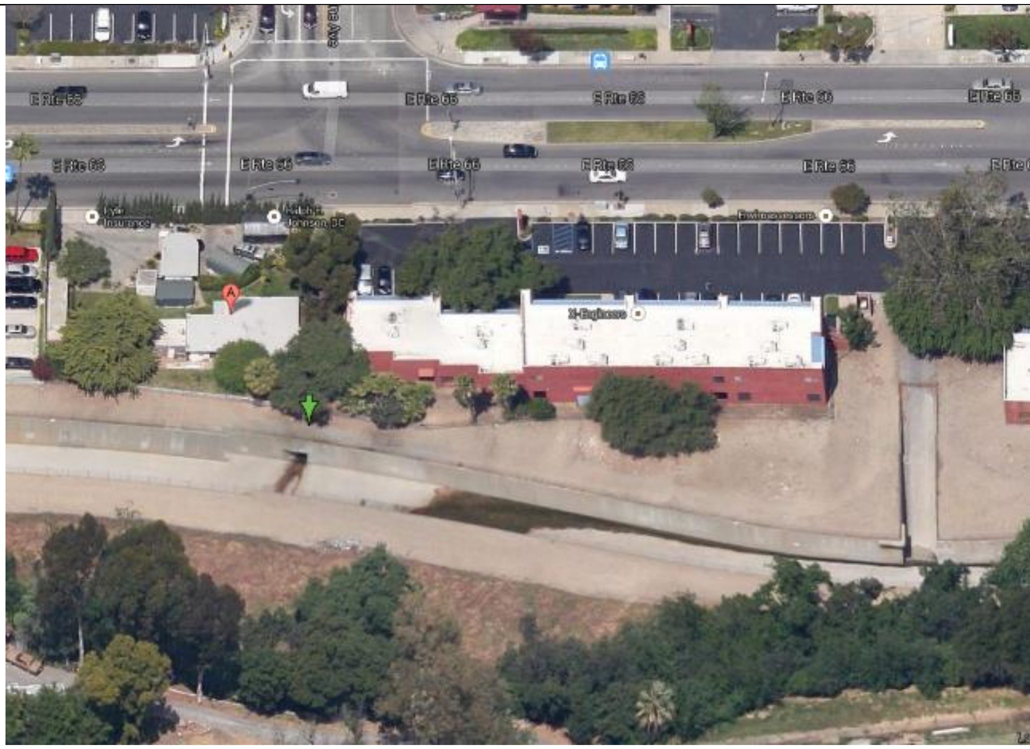
BI 1123

B-2.4 BI 3701 - Line C

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Big Dalton Wash	Glendora	BI 3701 -Line C	60 inches	SW Outfall	34.128306	-117.846414

General Description: New SW outfall monitoring site discharging to Big Dalton Wash downstream of E Route 66.





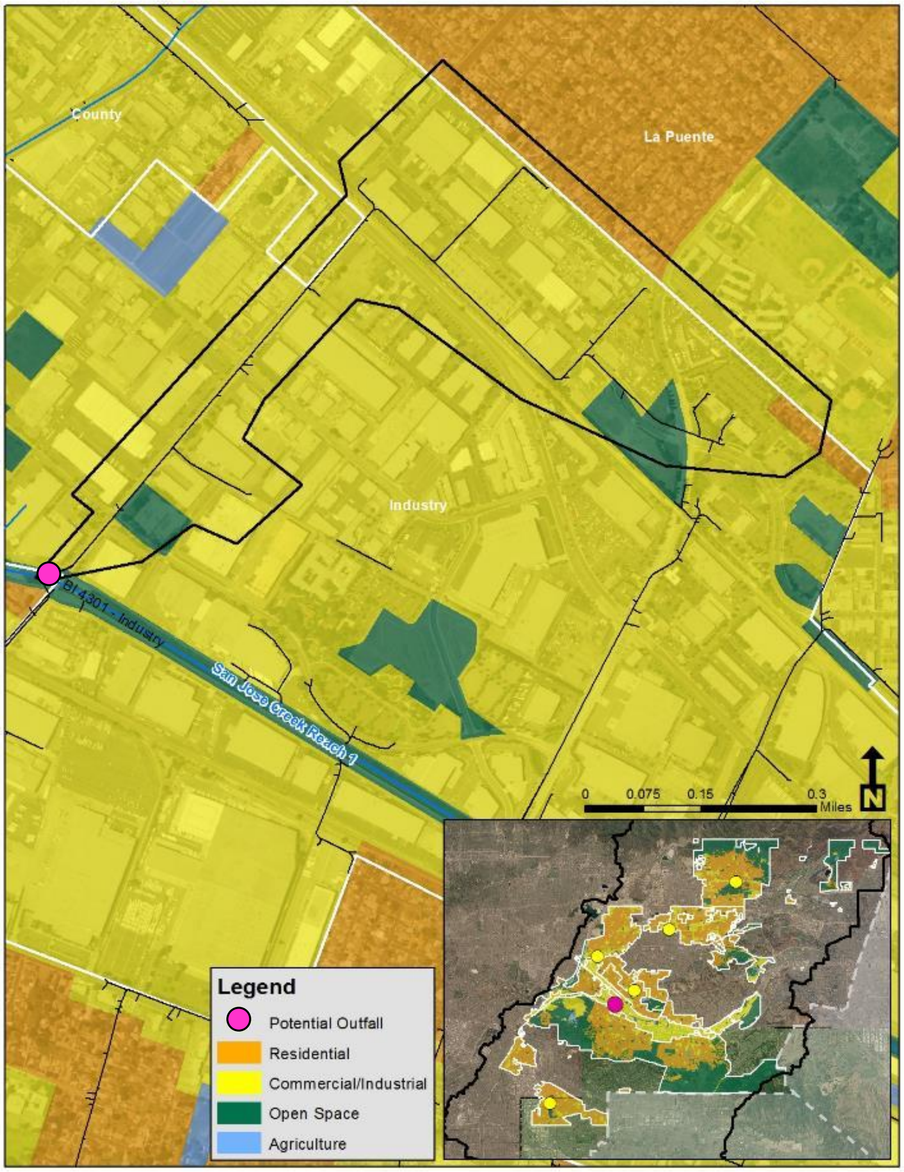
BI 3701 - Line C Aerial View

BI 3701 - Line C

B-2.5 BI 4301 –Industry

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
San Jose Creek Reach 1	Industry	BI 4301 -Industry	72 inches	SW Outfall	34.020765	-117.971385

General Description: New SW outfall monitoring site discharging to San Jose Creek Reach 1 just downstream of Turnbull Canyon Rd.

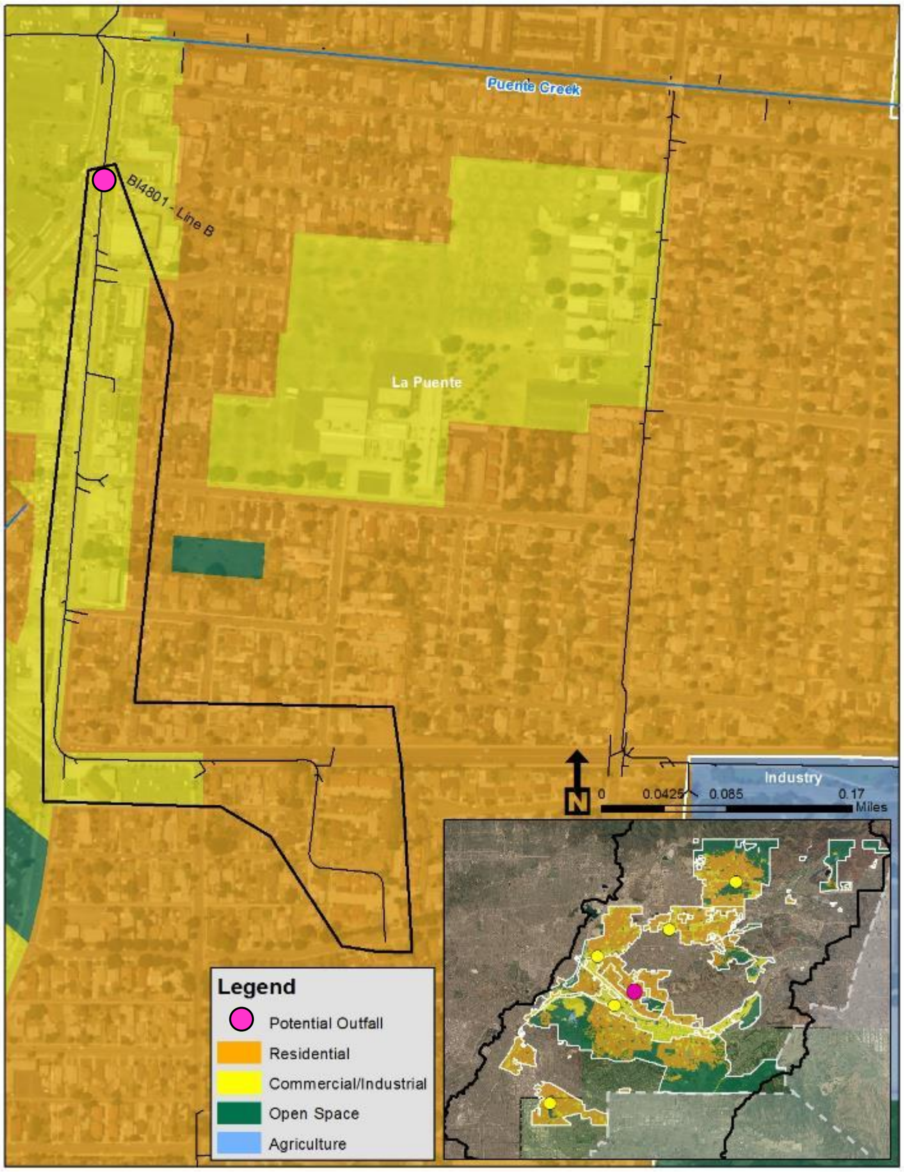


BI 4301 -Industry Aerial View

BI 4301 -Industry

B-2.6 BI 4801 –Line B

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Puente Creek	La Puente	BI 4801 –Line B	66 inches	SW Outfall	34.033704	-117.950301
General Description: New SW outfall monitoring site discharging to Puente Creek. Located on N Hacienda Blvd just north of Glendora Ave at nearest manhole upstream of subsurface discharge to Puente Creek.						



BI 4801 –Line B Aerial View

BI 4801 –Line B

Attachment C
Analytical and Monitoring Procedures

Attachment C details the monitoring procedures that will be utilized to collect and analyze samples to meet the goals and objectives of the CIMP and the Permit. The details contained herein serve as a guide for ensuring that consistent protocols and procedures are in place for successful sample collection and analysis. The attachment is divided into the following sections:

- Analytical Procedures
- Sample Method and Sample Handling
- Quality Control Sample Collection
- Instrument/Equipment Calibration and Frequency
- Data Management

C-1 ANALYTICAL PROCEDURES

The following subsections detail the analytical procedures for data generated in the field and in the laboratory.

C-1.1 Field Parameters

Portable field meters will measure field parameters within specifications outlined in **Table C-1**.

Table C-1.
Analytical Methods and Project Reporting Limits for Field Parameters

Parameter	Method	Range	Project RL
Current velocity	Electromagnetic	-0.5 to +20 ft/s	0.05 ft/s
pH	Electrometric	0 – 14 pH units	NA
Temperature	High stability thermistor	-5 – 50 oC	NA
Dissolved oxygen	Membrane	0 – 50 mg/L	0.5 mg/L
Turbidity	Nephelometric	0 – 3000 NTU	0.2 NTU
Conductivity	Graphite electrodes	0 – 10 mmhos/cm	2.5 umhos/cm

RL – Reporting Limit NA – Not applicable

C-1.2 Analytical Methods and Method Detection and Reporting Limits

Method detection limits (MDL) and reporting limits (RLs) must be distinguished for proper understanding and data use. The MDL is the minimum analyte concentration that can be measured and reported with a 99% confidence that the concentration is greater than zero. The RL represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and with confidence in both identification and quantitation.

For this CIMP, RLs must be verifiable by having the lowest non-zero calibration standard or calibration check sample concentration at or less than the RL. RLs have been established in this CIMP based on the verifiable levels and general measurement capabilities demonstrated for each method. These RLs should be considered as maximum allowable RLs to be used for laboratory data reporting. Note that samples diluted for analysis may have sample-specific RLs that exceed these RLs. This will be unavoidable on occasion. However, if samples are consistently diluted to overcome matrix interferences, the analytical laboratory will be required to notify the EWMP Group regarding how the sample preparation or test procedure in question will be modified to reduce matrix interferences so that project RLs can be met consistently.

Analytical methods and RLs required for samples analyzed in the laboratory are summarized in **Table C-2**, **Table C-3**, and **Table C-4** for analysis in water, sediment, and tissue, respectively. For organic constituents, environmentally relevant detection limits will be used to the extent practicable. The RLs listed in **Table C-2** are consistent with the requirements of the available minimum levels provided in the MRP, except for total dissolved solids, which was set equal to the minimum level identified in the California State Water Resources Control Board's Surface Water Ambient Monitoring Program's (SWAMP) Quality Assurance Project Plan. Alternative methods with RLs that are at or below those presented in **Table C-2**, **Table C-3**, and **Table C-4** are considered equivalent and can be used in place of the methods presented in **Table C-2**, **Table C-3**, and **Table C-4**.

Prior to the analysis of any environmental samples, the laboratory must have demonstrated the ability to meet the minimum performance requirements for each analytical method presented in **Table C-2**, **Table C-3**, and **Table C-4**. The initial demonstration of capability includes the ability to meet the project RLs, the ability to generate acceptable precision and accuracy, and other analytical and quality control parameters documented in this CIMP. Data quality objectives for precision and accuracy are summarized in **Table C-5**.

Table C-2.
Analytical Methods and Reporting Limits (RLs) for Laboratory Analysis of Water Samples

Parameter/Constituent	Method[1]	Units	Project RL	MRP Table D-2 ML
Toxicity				
Pimephales promelas	EPA-821-R-02-013 (1000.0) and EPA-821-R-02-012 (2000.0)	NA	NA	NA
Ceriodaphnia dubia	EPA-821-R-02-013 (1002.0) and EPA-821-R-02-012 (2002.0)	NA	NA	NA
Selenastrum capricornutum	EPA-821-R-02-013 (1003.0)	NA	NA	NA
Bacteria				
Escherichia coli	SM 9221	MPN/100mL	10	235
Conventionals				
Oil and Grease	EPA 1664A	mg/L	5	5
Cyanide	SM 4500-CN E	mg/L	0.005	0.005
pH	SM 4500 H+B/ EPA 9040/ EPA 9045D	NA	NA	0-14
Dissolved Oxygen	NA	mg/L	0.5	Sensitivity to 5 mg/L
Specific Conductance	EPA 120.1	µs/cm	1	1
Turbidity	EPA 180.1	NTU	0.1	0.1
Total Hardness	SM 2340C	mg/L	2	2
Dissolved Organic Carbon	SM 5310B	mg/L	0.6	NA
Total Organic Carbon	SM 5310B	mg/L	1	1

Parameter/Constituent	Method[1]	Units	Project RL	MRP Table D-2 ML
Total Petroleum Hydrocarbon	EPA 1664	mg/L	5	5
Biochemical Oxygen Demand	SMOL-5210	mg/L	5	2
Chemical Oxygen Demand	SM 5220D	mg/L	20	20-900
MBAS	SM 5540C	mg/L	0.5	0.5
Chloride	EPA 300.0	mg/L	1	2
Fluoride	EPA 300.0	mg/L	0.1	0.1
Sulfate	EPA 375.4	mg/L	1	NA
Perchlorate	EPA 314.0	µg/L	4	4
Chlorophyll a	SM 10200 H	mg/L	0.01	NA
Dissolved Phosphorus	SM 4500-P E	mg/L	0.05	0.05
Total Phosphorus	SM 4500-P E	mg/L	0.05	0.05
Orthophosphate-P	EPA 300.0	mg/L	0.2	NA
Ammonia (as N)	SM 4500-NH3 C	mg/L	0.1	0.1
Nitrate + Nitrite (as N)	EPA 300.0	mg/L	0.1	0.1
Nitrate (as N)	EPA 300.0	mg/L	0.1	0.1
Nitrite (as N)	EPA 300.0	mg/L	0.1	0.1
Total Kjehdahl Nitrogen (TKN)	SM 4500-NH3 C	mg/L	0.1	0.1
Total Alkalinity	SM 2320B	mg/L	2	2
Solids				
Suspended Sediment Concentration (SSC)	ASTMD 3977-97	mg/L	3	NA
Total Suspended Solids (TSS)	SM 2540D	mg/L	2	2
Total Dissolved Solids (TDS)	SM 2540C	mg/L	10	2
Volatile Suspended Solids	EPA 1684	mg/L	1	2
Metals in Freshwater (dissolved and total)				
Aluminum	EPA 200.8	µg/L	100	100
Antimony	EPA 200.8	µg/L	0.5	0.5
Arsenic	EPA 200.8	µg/L	1	1
Beryllium	EPA 200.8	µg/L	0.5	0.5
Cadmium	EPA 200.8	µg/L	0.25	0.25
Chromium (total)	EPA 200.8	µg/L	0.5	0.5
Chromium (Hexavalent)	EPA 200.8	µg/L	5	5
Copper	EPA 200.8	µg/L	0.5	0.5
Iron	EPA 200.8	µg/L	100	100
Lead	EPA 200.8	µg/L	0.5	0.5
Mercury	EPA 1631	µg/L	0.5	0.5

Parameter/Constituent	Method[1]	Units	Project RL	MRP Table D-2 ML
Nickel	EPA 200.8	µg/L	1	1
Selenium	EPA 200.8	µg/L	1	1
Silver	EPA 200.8	µg/L	0.25	0.25
Thallium	EPA 200.8	µg/L	1	1
Zinc	EPA 200.8	µg/L	1	1
Organochlorine Pesticides				
Aldrin	EPA 608	ng/L	5	5
alpha-BHC	EPA 608	ng/L	10	10
beta-BHC	EPA 608	ng/L	5	5
delta-BHC	EPA 608	ng/L	5	5
gamma-BHC (Lindane)	EPA 608	ng/L	20	20
Chlordane-alpha	EPA 608	ng/L	100	100
Chlordane-gamma	EPA 608	ng/L	100	100
Oxychlordane	EPA 608	ng/L	200	NA
Cis-nonachlor	EPA 608	ng/L	200	NA
Trans-nonachlor	EPA 608	ng/L	200	NA
2,4'-DDD	EPA 625/ 8270C	ng/L	2	NA
2,4'-DDE	EPA 625/ 8270C	ng/L	2	NA
2,4'-DDT	EPA 625/ 8270C	ng/L	2	NA
4,4’-DDD	EPA 625/ 8270C	ng/L	50	50
4,4’-DDE	EPA 625/ 8270C	ng/L	50	50
4,4’-DDT	EPA 625/ 8270C	ng/L	10	10
Dieldrin	EPA 608	ng/L	10	10
Endosulfan I	EPA 608	ng/L	20	20
Endosulfan II	EPA 608	ng/L	10	10
Endosulfan Sulfate	EPA 608	ng/L	50	50
Endrin	EPA 608	ng/L	10	10
Endrin Aldehyde	EPA 608	ng/L	10	10
Heptachlor	EPA 608	ng/L	10	10
Heptachlor Epoxide	EPA 608	ng/L	10	10
Toxaphene	EPA 608	ng/L	500	500
PCBs				
Congeners[2]	EPA 625/ 8270C	ng/L	2	NA
Aroclors (1016, 1221, 1232, 1242, 1248, 1254, 1260)	EPA 608/ 625/ 8270C	ng/L	500	500
Organophosphorus Pesticides				

Parameter/Constituent	Method[1]	Units	Project RL	MRP Table D-2 ML
Chlorpyrifos	EPA 614	ng/L	50	50
Diazinon	EPA 614	ng/L	10	10
Malathion	EPA 614	ng/L	1000	1000
Triazine				
Atrazine	EPA 530	µg/L	2	2
Cyanazine	EPA 530	µg/L	2	2
Prometryn	EPA 530	µg/L	2	2
Simazine	EPA 530	µg/L	2	2
Dioxins				
2,3,7,8-TCDD	EPA 1613	ng/L	0.005	NA
1,2,3,7,8-PeCDD	EPA 1613	ng/L	0.025	NA
1,2,3,7,8-PeCDF	EPA 1613	ng/L	0.025	NA
2,3,4,7,8-PeCDF	EPA 1613	ng/L	0.025	NA
1,2,3,4,7,8-HxCDD	EPA 1613	ng/L	0.025	NA
1,2,3,6,7,8-HxCDD	EPA 1613	ng/L	0.025	NA
1,2,3,7,8,9-HxCDD	EPA 1613	ng/L	0.025	NA
1,2,3,4,7,8-HxCDF	EPA 1613	ng/L	0.025	NA
1,2,3,6,7,8-HxCDF	EPA 1613	ng/L	0.025	NA
1,2,3,7,8,9-HxCDF	EPA 1613	ng/L	0.025	NA
2,3,4,6,7,8-HxCDF	EPA 1613	ng/L	0.025	NA
1,2,3,4,6,7,8-HpCDD	EPA 1613	ng/L	0.025	NA
1,2,3,4,6,7,8-HpCDF	EPA 1613	ng/L	0.025	NA
1,2,3,4,7,8,9-HpCDF	EPA 1613	ng/L	0.025	NA
OCDD	EPA 1613	ng/L	0.025	NA
OCDF	EPA 1613	ng/L	0.050	NA
Herbicides				
2,4-D	EPA 8151A	µg/L	10	10
Glyphosate	EPA 547	µg/L	5	5
2,4,5-TP-SILVEX	EPA 8151A	µg/L	0.5	0.5
Semivolatile Organic Compounds (SVOCs)				
1,2-Diphenylhydrazine	EPA 625	µg/L	1	1
2,4,6-Trichlorophenol	EPA 625	µg/L	10	10
2,4-Dichlorophenol	EPA 625	µg/L	1	1
2,4-Dimethylphenol	EPA 625	µg/L	2	2
2,4-Dinitrophenol	EPA 625	µg/L	5	5
2,4-Dinitrotoluene	EPA 625	µg/L	5	5

Parameter/Constituent	Method[1]	Units	Project RL	MRP Table D-2 ML
2,6-Dinitrotoluene	EPA 625	µg/L	5	5
2-Chloronaphthalene	EPA 625	µg/L	10	10
2-Chlorophenol	EPA 625	µg/L	2	2
2-Methyl-4,6-dinitrophenol	EPA 625	µg/L	5	5
2-Nitrophenol	EPA 625	µg/L	10	10
3,3'-Dichlorobenzidine	EPA 625	µg/L	5	5
4-Bromophenyl phenyl ether	EPA 625	µg/L	5	5
4-Chloro-3-methylphenol	EPA 625	µg/L	1	1
4-Chlorophenyl phenyl ether	EPA 625	µg/L	5	5
4-Nitrophenol	EPA 625	µg/L	5	5
Acenaphthene	EPA 625	µg/L	1	1
Acenaphthylene	EPA 625	µg/L	2	2
Anthracene	EPA 625	µg/L	2	2
Benzidine	EPA 625	µg/L	5	5
Benzo(a)anthracene	EPA 625	µg/L	5	5
Benzo(a)pyrene	EPA 625	µg/L	2	2
Benzo(b)fluoranthene	EPA 625	µg/L	10	10
Benzo(g,h,i)perylene	EPA 625	µg/L	5	5
Benzo(k)fluoranthene	EPA 625	µg/L	2	2
Benzyl butyl phthalate	EPA 625	µg/L	10	10
bis(2-Chloroethoxy) methane	EPA 625	µg/L	5	5
bis(2-Chloroisopropyl) ether	EPA 625	µg/L	2	2
bis(2-Chloroethyl) ether	EPA 625	µg/L	1	1
bis(2-Ethylhexyl) phthalate	EPA 625	µg/L	5	5
Chrysene	EPA 625	µg/L	5	5
Dibenzo(a,h)anthracene	EPA 625	µg/L	0.1	0.1
Diethyl phthalate	EPA 625	µg/L	2	2
Dimethyl phthalate	EPA 625	µg/L	2	2
Di-n-butylphthalate	EPA 625	µg/L	10	10
Di-n-octylphthalate	EPA 625	µg/L	10	10
Fluoranthene	EPA 625	µg/L	0.05	0.05
Fluorene	EPA 625	µg/L	0.1	0.1
Hexachlorobenzene	EPA 625	µg/L	1	1
Hexachlorobutadiene	EPA 625	µg/L	1	1
Hexachloro-cyclo pentadiene	EPA 625	µg/L	5	5
Hexachloroethane	EPA 625	µg/L	1	1
Indeno(1,2,3-cd)pyrene	EPA 625	µg/L	0.05	0.05

Parameter/Constituent	Method(1)	Units	Project RL	MRP Table D-2 ML
Isophorone	EPA 625	µg/L	1	1
Naphthalene	EPA 625	µg/L	0.2	0.2
Nitrobenzene	EPA 625	µg/L	1	1
N-Nitroso-dimethyl amine	EPA 625	µg/L	5	5
N-Nitrosodiphenylamine	EPA 625	µg/L	1	1
N-Nitroso-di-n-propyl amine	EPA 625	µg/L	5	5
Pentachlorophenol	EPA 625	µg/L	2	2
Phenanthrene	EPA 625	µg/L	0.05	0.05
Total Phenols	EPA 625	mg/L	0.2	0.1
Phenol	EPA 625	µg/L	1	1
Pyrene	EPA 625	µg/L	0.05	0.05
Volatile Organic Compounds				
1,2,4-Trichlorobenzene	EPA 625	µg/L	1	1
1,2-Dichlorobenzene	EPA 625	µg/L	1	1
1,3-Dichlorobenzene	EPA 625	µg/L	1	1
1,4-Dichlorobenzene	EPA 625	µg/L	1	1
2-Chloroethyl vinyl ether	EPA 625	µg/L	1	1
Methyl tert-butyl ether (MTBE)	EPA 625	µg/L	1	1

RL – Reporting Limit NA – Not applicable

1. Methods may be substituted by an equivalent method that is lower than or meets the project RL.
2. Analysis for PCB congeners includes the following constituents: PCB-8, 18, 28, 31, 33, 37, 44, 49, 52, 56, 60, 66, 70, 74, 77, 81, 87, 95, 97, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 132, 138, 141, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 174, 177, 180, 183, 187, 189, 194, 195, 201, 203, 206, and 209.

Table C-3.
Analytical Methods and Reporting Limits (RLs) for Laboratory Analysis of Sediment

Parameter/Constituent	Method[1]	Units	Project RL
General Parameters			
% Solids	EPA 1684	%	NA
Total Organic Carbon (TOC)	SM5310B	% Dry Weight	0.05
Chlordane Compounds			
alpha-Chlordane	USEPA 8081A/8270C	ng/dry g	0.5
gamma-Chlordane	USEPA 8081A/8270C	ng/dry g	0.5
Oxychlordane	USEPA 8081A/8270C	ng/dry g	0.5
trans-Nonachlor	USEPA 8081A/8270C	ng/dry g	0.5
cis-Nonachlor	USEPA 8081A/8270C	ng/dry g	0.5
Other OC Pesticides			
2,4'-DDD	USEPA 8081A/8270C	ng/dry g	0.5
2,4'-DDE	USEPA 8081A/8270C	ng/dry g	0.5
2,4'-DDT	USEPA 8081A/8270C	ng/dry g	0.5
4,4'-DDD	USEPA 8081A/8270C	ng/dry g	0.5
4,4'-DDE	USEPA 8081A/8270C	ng/dry g	0.5
4,4'-DDT	USEPA 8081A/8270C	ng/dry g	0.5
Total DDT	USEPA 8081A/8270C	ng/dry g	NA
Dieldrin	USEPA 8081A/8270C	ng/dry g	0.02
PAHs			
1-Methylnaphthalene	USEPA 8270C/8270D - SIM	ng/dry g	20
1-Methylphenanthrene	USEPA 8270C/8270D - SIM	ng/dry g	20
2-Methylnaphthalene	USEPA 8270C/8270D - SIM	ng/dry g	20
2,6-Dimethylnaphthalene	USEPA 8270C/8270D - SIM	ng/dry g	20
Acenaphthene	USEPA 8270C/8270D - SIM	ng/dry g	20
Anthracene	USEPA 8270C/8270D - SIM	ng/dry g	20
Benzo(a)anthracene	USEPA 8270C/8270D - SIM	ng/dry g	20
Benzo(a)pyrene	USEPA 8270C/8270D - SIM	ng/dry g	20
Benzo(e)pyrene	USEPA 8270C/8270D - SIM	ng/dry g	20
Biphenyl	USEPA 8270C/8270D - SIM	ng/dry g	20
Chrysene	USEPA 8270C/8270D - SIM	ng/dry g	20
Dibenz(a,h)anthracene	USEPA 8270C/8270D - SIM	ng/dry g	20
Fluoranthene	USEPA 8270C/8270D - SIM	ng/dry g	20
Fluorene	USEPA 8270C/8270D - SIM	ng/dry g	20
Naphthalene	USEPA 8270C/8270D - SIM	ng/dry g	20
Perylene	USEPA 8270C/8270D - SIM	ng/dry g	20
Phenanthrene	USEPA 8270C/8270D - SIM	ng/dry g	20

Parameter/Constituent	Method[1]	Units	Project RL
Pyrene	USEPA 8270C/8270D - SIM	ng/dry g	20
Total PCBs[2]	USEPA 8270C/8270D-SIM	ng/dry g	0.2
Metals			
Cadmium	EPA 6020	µg/dry g	0.05
Copper	EPA 6020	µg/dry g	0.05
Lead	EPA 6020	µg/dry g	0.05
Silver	EPA 6020	µg/dry g	0.05
Zinc	EPA 6020	µg/dry g	0.05

RL – Reporting Limit NA – Not applicable

1. Methods may be substituted by an equivalent method that is lower than or meets the project RL.
2. Analysis for PCBs includes the following constituents: PCB-8, 18, 28, 31, 33, 37, 44, 49, 52, 56, 60, 66, 70, 74, 77, 81, 87, 95, 97, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 132, 138, 141, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 174, 177, 180, 183, 187, 189, 194, 195, 201, 203, 206, and 209.

Table C-4.
Analytical Methods and Reporting Limits (RLs) for Laboratory Analysis of Tissue

Parameter/Constituent	Method[1]	Units	Project RL
Chlordane[2]	EPA 8270C	ng/dry g	5
Dieldrin	EPA 8270C	ng/dry g	5
PCBs[3]	EPA 8270C	ng/dry g	5

RL – Reporting Limit NA – Not applicable

1. Methods may be substituted by an equivalent method that is lower than or meets the project RL.
2. Analysis for chlordane includes the following constituents: alpha-chlordane, gamma-chlordane, oxychlordane, cis-Nonachlor, and trans-Nonachlor.
3. Analysis for PCBs includes the following constituents: PCB-8, 18, 28, 31, 33, 37, 44, 49, 52, 56, 60, 66, 70, 74, 77, 81, 87, 95, 97, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 132, 138, 141, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 174, 177, 180, 183, 187, 189, 194, 195, 201, 203, 206, and 209.

Table C-5.
Data Quality Objectives

Parameter	Accuracy	Precision	Recovery	Completeness
Field Measurements				
Water Velocity (for Flow calc.)	2%	NA	NA	90%
pH	+ 0.2 pH units	+ 0.5 pH units	NA	90%
Temperature	+ 0.5 oC	+ 5%	NA	90%
Dissolved Oxygen	+ 0.5 mg/L	+ 10%	NA	90%
Turbidity	10%	10%	NA	90%
Conductivity	5%	5%	NA	90%
Laboratory Analyses – Water				
Conventionals and Solids	80 – 120%	0 – 25%	80 – 120%	90%
Aquatic Toxicity	(1)	(2)	NA	90%
Nutrients(3)	80 – 120%	0 – 25%	90 – 110%	90%
Metals(3)	75 – 125%	0 – 25%	75 – 125%	90%
Dioxin(3)	50 – 150%	0 – 25%	50 – 150%	90%
Semi-Volatile Organics(3)	50 – 150%	0 – 25%	50 – 150%	90%
Volatile Organics(3)	50 – 150%	0 – 25%	50 – 150%	90%
Triazines(3)	50 – 150%	0 – 25%	50 – 150%	90%
Herbicides(3)	50 – 150%	0 – 25%	50 – 150%	90%
OC Pesticides(3)	50 – 150%	0 – 25%	50 – 150%	90%
PCB Congeners(3)	50 – 150%	0 – 25%	50 – 150%	90%
PCB Aroclors(3)	50 – 150%	0 – 25%	50 – 150%	90%
OP Pesticides(3)	50 – 150%	0 – 25%	50 – 150%	90%
Laboratory Analyses – Sediment				
% Solids	NA	NA	NA	90%
Total Organic Carbon (TOC)	80 – 120%	0 – 25%	80 – 120%	90%
OC Pesticides(3)	25 – 140%	0 – 30%	25 – 140%	90%
PCB Congeners(3)	60 – 125%	0 – 30%	60 – 125%	90%
PAHs(3)	50 – 150%	0 – 25%	50 – 150%	90%
Metals(3)	60 – 130%	0 – 30%	60 – 130%	90%
Laboratory Analyses – Tissue				
Chlordane(3)	50 – 150%	0 – 25%	50 – 150%	90%
DDTs(3)	35 – 140%	0 – 30%	35 – 140%	90%
Dieldrin(3)	50 – 150%	0 – 25%	50 – 150%	90%

1. Must meet all method performance criteria relative to the reference toxicant test.
2. Must meet all method performance criteria relative to sample replicates.
3. See **Table C-2**, **Table C-3**, and **Table C-4** for a list of individual constituents in each suite for water, sediment, and tissue, respectively.

C-1.2.1 Monitoring and Analysis Carried out by other Agencies

Monitoring and analysis for the existing S14 mass emission station will be carried out by LACFCD. Analysis of receiving water samples will be evaluated according to the analytical methods and method detection limits found in **Table C-6**. Monitoring and analysis for the SGRRMP in the San Gabriel River Estuary is carried out by the LACSD. Analytical methods and data quality objectives for analysis of sediment samples are found in **Table C-7** and **Table C-8**.

Table C-6.
LACFCD Analytical Methods and Reporting Limits (RLs) for Laboratory Analysis of Water

Analytical Method	Analyte	Permit ML	Unit	Comment	LACFCD's Ag Lab	
					MRL	MDL
Conventional Pollutants						
EPA 1664A	Oil and Grease	5	mg/L		5	1.44
EPA 420.1	Total Phenols	0.1	mg/L		0.1	0.03
SM 4500-CN- E	Cyanide	0.005	mg/L		0.005	0.005
SM 4500-H+ B	pH	0 - 14	pH	Field test	0.1	0.1
SM 2550B	Temperature	N/A	C	Field test	0.01	0.01
SM 4500-O G	Dissolved Oxygen	Sensitivity to 5	mg/L	Field test	1	1
BACTERIA (single sample limits)						
SM9221B	Total coliform (marine waters)	10,000	MPN/100ml		20	20
SM 9230B	Enterococcus (marine waters)	104	MPN/100ml		20	20
SM 9221E	Fecal coliform (marine & fresh waters)	400	MPN/100ml		20	20
SM 9221E/ Colilert-QT	E. coli (fresh waters)	235	MPN/100ml		1	1
GENERAL						
SM 4500-P E	Dissolved Phosphorus	0.05	mg/L		0.05	0.05
SM 4500-P E	Total Phosphorus	0.05	mg/L		0.05	0.05
SM 2130 B	Turbidity	0.1	NTU		0.1	0.1
SM 2540D	Total Suspended Solids	2	mg/L		2	1
SM 2540E	Volatile Suspended Solids	2	mg/L		1	1
SM 5310B	Total Organic Carbon	1	mg/L		1	0.5
EPA 418.1	Total Petroleum Hydrocarbon	5	mg/L		5	1.5
SM 5210 B	Biochemical Oxygen	2	mg/L		2	1

Analytical Method	Analyte	Permit ML	Unit	Comment	LACFCD's Ag Lab	
					MRL	MDL
	Demand					
SM 5220 D	Chemical Oxygen Demand	20-900	mg/L		20	10
SM 4500-NH3 C	Total Ammonia-Nitrogen	0.1	mg/L		0.1	0.1
SM4500-NH3 C	Total Kjeldahl Nitrogen	0.1	mg/L		0.1	0.1
EPA 300.0	Nitrate-N	0.1	mg/L		0.1	0.1
EPA 300.0	Nitrite -N	0.1	mg/L		0.1	0.1
SM 2320B	Alkalinity	2	mg/L		2	2
SM 2510 B	Specific Conductance	1	umho/cm		1	1
SM 2340C	Total Hardness	2	mg/L		2	2
SM 5540C	MBAS	0.5	mg/L		0.5	0.1
EPA 300.0	Chloride	2	mg/L		1	1
EPA 300.0	Fluoride	0.1	mg/L		0.1	0.1
EPA 624	Methyl tertiary butyl ether (MTBE)	1	mg/L		1	0.33
EPA 314.0	Perchlorate	4	µg/L		4	4
METALS (Dissolved & Solid)						
EPA 200.8	Aluminum	100	µg/L		100	50
EPA 200.8	Antimony	0.5	µg/L		0.5	0.5
EPA 200.8	Arsenic	1	µg/L		1	0.2
EPA 200.8	Beryllium	0.5	µg/L		0.5	0.1
EPA 200.8	Cadmium	0.25	µg/L		0.25	0.1
EPA 218.6	Chromium (Hexavalent)	5	µg/L		5	0.25
EPA 200.8	Chromium (total)	0.5	µg/L		0.5	0.5
EPA 200.8	Copper	0.5	µg/L		0.5	0.5
EPA 200.8	Iron	100	µg/L		100	50
EPA 200.8	Lead	0.5	µg/L		0.5	0.2
EPA 245.1	Mercury	0.5	µg/L		0.5	0.1
EPA 200.8	Nickel	1	µg/L		1	0.5
EPA 200.8	Selenium	1	µg/L		1	0.5
EPA 200.8	Silver	0.25	µg/L		0.25	0.1
EPA 200.8	Thallium	1	µg/L		1	0.1
EPA 200.8	Zinc	1	µg/L		1	1
SEMIVOLATILE ORGANIC COMPOUNDS						

Analytical Method	Analyte	Permit ML	Unit	Comment	LACFCD's Ag Lab	
					MRL	MDL
			ACIDS			
EPA 625	2-Chlorophenol	2	µg/L		2	0.67
EPA 625	4-Chloro-3-methylphenol	1	µg/L		1	1
EPA 625	2,4-Dichlorophenol	1	µg/L		1	1
EPA 625	2,4-Dimethylphenol	2	µg/L		2	0.67
EPA 625	2,4-Dinitrophenol	5	µg/L		5	1
EPA 625	2-Nitrophenol	10	µg/L		10	1
EPA 625	4-Nitrophenol	5	µg/L		5	1
EPA 625	Pentachlorophenol	2	µg/L		2	0.67
EPA 625	Phenol	1	µg/L		1	0.33
EPA 625	2,4,6-Trichlorophenol	10	µg/L		10	3.33
			BASE/NEUTRAL			
EPA 625	Acenaphthene	1	µg/L		1	0.33
EPA 625	Acenaphthylene	2	µg/L		2	0.67
EPA 625 SIM	Acenaphthylene	2	µg/L			
EPA 625	Anthracene	2	µg/L		2	0.67
EPA 625	Benzidine	5	µg/L		5	1.67
EPA 625	1,2 Benzanthracene	5	µg/L	Benzo(a)Ant	5	1.67
EPA 625	Benzo(a)pyrene	2	µg/L		2	0.67
EPA 625	Benzo(g,h,i)perylene	5	µg/L		5	1.67
EPA 625	3,4 Benzofluoranthene	10	µg/L	Benzo(b)fluor	10	3.33
EPA 625	Benzo(k)flouranthene	2	µg/L		2	0.67
EPA 625	Bis(2-Chloroethoxy) methane	5	µg/L		5	1.67
EPA 625	Bis(2-Chloroisopropyl) ether	2	µg/L		2	0.67
EPA 625	Bis(2-Chloroethyl) ether	1	µg/L		1	0.33
EPA 625	Bis(2-Ethylhexyl) phthalate	5	µg/L		5	1.67
EPA 625	4-Bromophenyl phenyl ether	5	µg/L		5	1.67
EPA 625	Butyl benzyl phthalate	10	µg/L		10	3.33
EPA624	2-Chloroethyl vinyl ether	1	µg/L		1	0.33
EPA 625	2-Chloronaphthalene	10	µg/L		10	3.33

Analytical Method	Analyte	Permit ML	Unit	Comment	LACFCD's Ag Lab	
					MRL	MDL
EPA 625	4-Chlorophenyl phenyl ether	5	µg/L		5	1.67
EPA 625	Chrysene	5	µg/L		5	1.67
EPA 625	Dibenzo(a,h)anthracene	0.1	µg/L		0.1	0.033
EPA 625	1,3-Dichlorobenzene	1	µg/L		1	0.5
EPA 625	1,4-Dichlorobenzene	1	µg/L		1	0.5
EPA 625	1,2-Dichlorobenzene	1	µg/L		1	0.5
EPA 625	3,3-Dichlorobenzidine	5	µg/L		5	1.67
EPA 625	Diethyl phthalate	2	µg/L		2	1
EPA 625	Dimethyl phthalate	2	µg/L		2	1
EPA 625	di-n-Butyl phthalate	10	µg/L		10	3.33
EPA 625	2,4-Dinitrotoluene	5	µg/L		5	1.67
EPA 625	2,6-Dinitrotoluene	5	µg/L		5	1.67
EPA 625	4,6 Dinitro-2-methylphenol	5	µg/L		5	1
EPA 625	1,2-Diphenylhydrazine	1	µg/L		1	0.33
EPA 625	di-n-Octyl phthalate	10	µg/L		10	3.33
EPA 625	Fluoranthene	0.05	µg/L		0.05	0.017
EPA 625	Fluorene	0.1	µg/L		0.1	0.033
EPA 625	Hexachlorobenzene	1	µg/L		1	0.33
EPA 625	Hexachlorobutadiene	1	µg/L		1	0.33
EPA 625	Hexachloro-cyclopentadiene	5	µg/L		5	1.67
EPA 625	Hexachloroethane	1	µg/L		1	0.33
EPA 625	Indeno(1,2,3-cd)pyrene	0.05	µg/L		0.05	0.017
EPA 625	Isophorone	1	µg/L		1	0.33
EPA 625	Naphthalene	0.2	µg/L		0.2	0.067
EPA 625	Nitrobenzene	1	µg/L		1	0.33
EPA 625	N-Nitroso-dimethyl amine	5	µg/L		5	1.67
EPA 625	N-Nitroso-diphenyl amine	1	µg/L		1	0.33
EPA 625	N-Nitroso-di-n-propyl amine	5	µg/L		5	1.67
EPA 625	Phenanthrene	0.05	µg/L		0.05	0.017
EPA 625	Pyrene	0.05	µg/L		0.05	0.017
EPA 625	1,2,4-Trichlorobenzene	1	µg/L		1	0.33

Analytical Method	Analyte	Permit ML	Unit	Comment	LACFCD's Ag Lab	
					MRL	MDL
Chlorinated Pesticides						
EPA 608	Aldrin	0.005	µg/L		0.005	0.005
EPA 608	alpha-BHC	0.01	µg/L		0.01	0.01
EPA 608	beta-BHC	0.005	µg/L		0.005	0.005
EPA 608	delta-BHC	0.005	µg/L		0.005	0.005
EPA 608	gamma-BHC (lindane)	0.02	µg/L		0.02	0.02
EPA 608	alpha-chlordane	0.1	µg/L		0.1	0.1
EPA 608	gamma-chlordane	0.1	µg/L		0.1	0.1
EPA 608	4,4'-DDD	0.05	µg/L		0.05	0.05
EPA 608	4,4'-DDE	0.05	µg/L		0.05	0.05
EPA 608	4,4'-DDT	0.01	µg/L		0.01	0.01
EPA 608	Dieldrin	0.01	µg/L		0.01	0.01
EPA 608	alpha-Endosulfan	0.02	µg/L		0.02	0.02
EPA 608	beta-Endosulfan	0.01	µg/L		0.01	0.01
EPA 608	Endosulfan sulfate	0.05	µg/L		0.05	0.05
EPA 608	Endrin	0.01	µg/L		0.01	0.01
EPA 608	Endrin aldehyde	0.01	µg/L		0.01	0.01
EPA 608	Heptachlor	0.01	µg/L		0.01	0.01
EPA 608	Heptachlor Epoxide	0.01	µg/L		0.01	0.01
EPA 608	Toxaphene	0.5	µg/L		0.5	0.5
POLYCHLORINATED BIPHENYLS						
EPA 608	Aroclor-1016	0.5	µg/L		0.5	0.5
EPA 608	Aroclor-1221	0.5	µg/L		0.5	0.5
EPA 608	Aroclor-1232	0.5	µg/L		0.5	0.5
EPA 608	Aroclor-1242	0.5	µg/L		0.5	0.5
EPA 608	Aroclor-1248	0.5	µg/L		0.5	0.5
EPA 608	Aroclor-1254	0.5	µg/L		0.5	0.5
EPA 608	Aroclor-1260	0.5	µg/L		0.5	0.5
ORGANOPHOSPHATE PESTICIDES						
EPA507	Atrazine	2	µg/L		2	0.667
EPA507	Chlorpyrifos	0.05	µg/L		0.05	0.02
EPA507	Cyanazine	2	µg/L		2	0.667
EPA507	Diazinon	0.01	µg/L		0.01	0.003

Analytical Method	Analyte	Permit ML	Unit	Comment	LACFCD's Ag Lab	
					MRL	MDL
EPA507	Malathion	1	µg/L		1	0.33
EPA507	Prometryn	2	µg/L		2	0.67
EPA507	Simazine	2	µg/L		2	0.67
HERBICIDES						
EPA 515.3	2,4-D	10	µg/L		0.2	0.02
EPA 547	Glyphosate	5	µg/L		5	5
EPA 515.3	2,4,5-TP-SILVEX	0.5	µg/L		0.2	0.067

Table C-7.
LACSD Analytical Methods and Reporting Limits (RLs) for Laboratory Analysis of Sediment

Group	AnalyteName	MethodName	Units	MDL	RL
General Chemistry	Phosphorus as P	SM 4500-P E	mg/Kg dw	0.016	0.05
	Total Kjeldahl Nitrogen	EPA 351.3	mg/Kg dw	5	5
	Total Organic Carbon	SM 5310 B	% dw	0.01	0.02
Metals	Arsenic	EPA 6020	mg/Kg dw	0.025	0.05
	Cadmium	EPA 6020	mg/Kg dw	0.025	0.05
	Chromium	EPA 6020	mg/Kg dw	0.025	0.05
	Copper	EPA 6020	mg/Kg dw	0.025	0.05
	Iron	EPA 6020	mg/Kg dw	1	5
	Lead	EPA 6020	mg/Kg dw	0.025	0.05
	Mercury	EPA 245.7	mg/Kg dw	0.00001	0.00002
	Nickel	EPA 6020	mg/Kg dw	0.025	0.05
	Selenium	EPA 6020	mg/Kg dw	0.025	0.05
	Zinc	EPA 6020	mg/Kg dw	0.025	0.05
Organochlorine	Aldrin	EPA 8270C	ng/g dw	1	5
	Chlordane, cis-	EPA 8270C	ng/g dw	1	5
	Chlordane, trans-	EPA 8270C	ng/g dw	1	5
	DDD(o,p')	EPA 8270C	ng/g dw	1	5
	DDD(p,p')	EPA 8270C	ng/g dw	1	5
	DDE(o,p')	EPA 8270C	ng/g dw	1	5
	DDE(p,p')	EPA 8270C	ng/g dw	1	5
	DDT(o,p')	EPA 8270C	ng/g dw	1	5
	DDT(p,p')	EPA 8270C	ng/g dw	1	5

Group	AnalyteName	MethodName	Units	MDL	RL
	Dieldrin	EPA 8270C	ng/g dw	1	5
	Endosulfan I	EPA 8270C	ng/g dw	1	5
	Endosulfan II	EPA 8270C	ng/g dw	1	5
	Endosulfan sulfate	EPA 8270C	ng/g dw	1	5
	Endrin	EPA 8270C	ng/g dw	1	5
	Endrin Aldehyde	EPA 8270C	ng/g dw	1	5
	Endrin Ketone	EPA 8270C	ng/g dw	1	5
	HCH, alpha	EPA 8270C	ng/g dw	1	5
	HCH, beta	EPA 8270C	ng/g dw	1	5
	HCH, delta	EPA 8270C	ng/g dw	1	5
	HCH, gamma	EPA 8270C	ng/g dw	1	5
	Heptachlor	EPA 8270C	ng/g dw	1	5
	Heptachlor epoxide	EPA 8270C	ng/g dw	1	5
	Methoxychlor	EPA 8270C	ng/g dw	1	5
	Mirex	EPA 8270C	ng/g dw	1	5
	Nonachlor, cis-	EPA 8270C	ng/g dw	1	5
	Nonachlor, trans-	EPA 8270C	ng/g dw	1	5
	Oxychlordane	EPA 8270C	ng/g dw	1	5
	Acenaphthene	EPA 8270C	ng/g dw	1	5
	Acenaphthylene	EPA 8270C	ng/g dw	1	5
PAHs	Anthracene	EPA 8270C	ng/g dw	1	5
	Benz(a)anthracene	EPA 8270C	ng/g dw	1	5
	Benzo(a)pyrene	EPA 8270C	ng/g dw	1	5
	Benzo(b)fluoranthene	EPA 8270C	ng/g dw	1	5
	Benzo(e)pyrene	EPA 8270C	ng/g dw	1	5
	Benzo(g,h,i)perylene	EPA 8270C	ng/g dw	1	5
	Benzo(k)fluoranthene	EPA 8270C	ng/g dw	1	5
	Biphenyl	EPA 8270C	ng/g dw	1	5
	Chrysene	EPA 8270C	ng/g dw	1	5
PAHs	Dibenz(a,h)anthracene	EPA 8270C	ng/g dw	1	5
	Dibenzothiophene	EPA 8270C	ng/g dw	1	5
	Dimethylnaphthalene, 2,6-	EPA 8270C	ng/g dw	1	5
	Fluoranthene	EPA 8270C	ng/g dw	1	5
	Fluorene	EPA 8270C	ng/g dw	1	5
	Indeno(1,2,3-	EPA 8270C	ng/g dw	1	5

Group	AnalyteName	MethodName	Units	MDL	RL
	c,d)pyrene				
	Methylnaphthalene, 1-	EPA 8270C	ng/g dw	1	5
	Methylnaphthalene, 2-	EPA 8270C	ng/g dw	1	5
	Methylphenanthrene, 1-	EPA 8270C	ng/g dw	1	5
	Naphthalene	EPA 8270C	ng/g dw	1	5
	Perylene	EPA 8270C	ng/g dw	1	5
	Phenanthrene	EPA 8270C	ng/g dw	1	5
	Pyrene	EPA 8270C	ng/g dw	1	5
	Trimethylnaphthalene, 2,3,5-	EPA 8270C	ng/g dw	1	5
PCBs	PCB 003	EPA 8270C	ng/g dw	1	5
	PCB 008	EPA 8270C	ng/g dw	1	5
	PCB 018	EPA 8270C	ng/g dw	1	5
	PCB 028	EPA 8270C	ng/g dw	1	5
	PCB 031	EPA 8270C	ng/g dw	1	5
	PCB 033	EPA 8270C	ng/g dw	1	5
	PCB 037	EPA 8270C	ng/g dw	1	5
	PCB 044	EPA 8270C	ng/g dw	1	5
	PCB 049	EPA 8270C	ng/g dw	1	5
	PCB 052	EPA 8270C	ng/g dw	1	5
	PCB 056	EPA 8270C	ng/g dw	1	5
	PCB 066	EPA 8270C	ng/g dw	1	5
	PCB 070	EPA 8270C	ng/g dw	1	5
	PCB 074	EPA 8270C	ng/g dw	1	5
	PCB 077	EPA 8270C	ng/g dw	1	5
	PCB 081	EPA 8270C	ng/g dw	1	5
	PCB 087	EPA 8270C	ng/g dw	1	5
	PCB 095	EPA 8270C	ng/g dw	1	5
	PCB 097	EPA 8270C	ng/g dw	1	5
	PCB 099	EPA 8270C	ng/g dw	1	5
	PCB 101	EPA 8270C	ng/g dw	1	5
	PCB 105	EPA 8270C	ng/g dw	1	5
PCBs	PCB 110	EPA 8270C	ng/g dw	1	5
	PCB 114	EPA 8270C	ng/g dw	1	5
	PCB 118	EPA 8270C	ng/g dw	1	5

Group	AnalyteName	MethodName	Units	MDL	RL
	PCB 119	EPA 8270C	ng/g dw	1	5
	PCB 123	EPA 8270C	ng/g dw	1	5
	PCB 126	EPA 8270C	ng/g dw	1	5
	PCB 128	EPA 8270C	ng/g dw	1	5
	PCB 138	EPA 8270C	ng/g dw	1	5
	PCB 141	EPA 8270C	ng/g dw	1	5
	PCB 149	EPA 8270C	ng/g dw	1	5
	PCB 151	EPA 8270C	ng/g dw	1	5
	PCB 153	EPA 8270C	ng/g dw	1	5
	PCB 156	EPA 8270C	ng/g dw	1	5
	PCB 157	EPA 8270C	ng/g dw	1	5
	PCB 158	EPA 8270C	ng/g dw	1	5
	PCB 167	EPA 8270C	ng/g dw	1	5
	PCB 168	EPA 8270C	ng/g dw	1	5
	PCB 169	EPA 8270C	ng/g dw	1	5
	PCB 170	EPA 8270C	ng/g dw	1	5
	PCB 174	EPA 8270C	ng/g dw	1	5
	PCB 177	EPA 8270C	ng/g dw	1	5
	PCB 180	EPA 8270C	ng/g dw	1	5
	PCB 183	EPA 8270C	ng/g dw	1	5
	PCB 187	EPA 8270C	ng/g dw	1	5
	PCB 189	EPA 8270C	ng/g dw	1	5
	PCB 194	EPA 8270C	ng/g dw	1	5
	PCB 195	EPA 8270C	ng/g dw	1	5
	PCB 201	EPA 8270C	ng/g dw	1	5
	PCB 206	EPA 8270C	ng/g dw	1	5
	PCB 209	EPA 8270C	ng/g dw	1	5

Table C-8. SGRRMP Data Quality Objectives

Parameter	Fraction	Accuracy: Requirements	Accuracy: Recovery	Precision	Completeness	Laboratory	Target Reporting Limits	Units
Grain Size: Estuary Sediment								
Sediment grain size	None	N/A	N/A	Laboratory Duplicate - RPD < 25%	90%	ABC	<2000 - >0.2	µm
Nutrients: Estuary Sediment								
Total Kjeldahl Nitrogen	None	None	N/A	Laboratory Duplicate - RPD < 25%	90%	IIRMES	0.04	mg/Kg dw
Phopsphorous as P	Total	Reference Material (CRM, SRM or LCS) and Matrix Spike	80 - 120%	Laboratory duplicate, Blind Field duplicate, or MS/MSD 25%. RPD Laboratory duplicate minimum.	90%	IIRMES	0.05	mg/Kg dw
Total Organic Carbon	Total					IIRMES	0.02	% dw
Metals: Estuary Sediment								
Arsenic	Total	Reference Material (CRM, SRM or LCS) and Matrix Spike. Matrix spikes sometimes have poor recovery in sediments, in which case a case a CRM and an LCS may be used.	75 -125% (70 - 130 % for Hg)	Laboratory Duplicate and Matrix Spike (or CRM) Duplicate - RPD < 25%	90%	IIRMES	0.5	mg/Kg dw
Cadmium	Total					IIRMES	0.4	mg/Kg dw
Chromium	Total					IIRMES	0.5	mg/Kg dw
Copper	Total					IIRMES	0.8	mg/Kg dw
Iron	Total					IIRMES	10	mg/Kg dw
Lead	Total					IIRMES	0.1	mg/Kg dw
Mercury	Total					IIRMES	0.02	mg/Kg dw
Nickel	Total					IIRMES	0.5	mg/Kg dw
Selenium	Total					IIRMES	0.5	mg/Kg dw
Zinc	Total					IIRMES	0.5	mg/Kg dw
Organochlorine Pesticides: Estuary Sediment								
Aldrin	Total	Reference Material (CRM, SRM or LCS) and Matrix Spike	50 - 150%	Laboratory Duplicate and Matrix Spike Duplicate - RPD < 25%	90%	IIRMES	1	ng/g dw
Chlordane, cis-	Total		50 - 150%			IIRMES	1	ng/g dw
Chlordane, trans-	Total		50 - 150%			IIRMES	1	ng/g dw
DDD(o,p')	Total		50 - 150%			IIRMES	1	ng/g dw

Parameter	Fraction	Accuracy		Precision	Completeness	Laboratory	Target Reporting Limits	Units
		Requirements	Recovery					
DDD(p,p')	Total		50 - 150%			IIRMES	1	ng/g dw
DDE(o,p')	Total		50 - 150%			IIRMES	1	ng/g dw
DDE(p,p')	Total		50 - 150%			IIRMES	1	ng/g dw
DDT(o,p')	Total		50 - 150%			IIRMES	1	ng/g dw
DDT(p,p')	Total		50 - 150%			IIRMES	1	ng/g dw
Dieldrin	Total		50 - 150%			IIRMES	1	ng/g dw
Endosulfan I	Total		50 - 150%			IIRMES	5	ng/g dw
Endosulfan II	Total		50 - 150%			IIRMES	5	ng/g dw
Endosulfan Sulfate	Total		50 - 150%			IIRMES	5	ng/g dw
Endrin	Total		50 - 150%			IIRMES	5	ng/g dw
Endrin Aldehyde	Total		33 - 138%			IIRMES	5	ng/g dw
Endrin Ketone	Total		50 - 150%			IIRMES	5	ng/g dw
HCH, alpha	Total		50 - 150%			IIRMES	1	ng/g dw
HCH, beta	Total		50 - 150%			IIRMES	1	ng/g dw
HCH, delta	Total		50 - 150%			IIRMES	1	ng/g dw
HCH, gamma	Total		50 - 150%			IIRMES	1	ng/g dw
Heptachlor	Total		50 - 150%			IIRMES	1	ng/g dw
Heptachlor Epoxide	Total		50 - 150%			IIRMES	1	ng/g dw
Methoxychlor	Total		34 - 143%			IIRMES	1	ng/g dw
Mirex	Total		50 - 150%			IIRMES	1	ng/g dw
Nonachlor, cis-	Total		50 - 150%			IIRMES	1	ng/g dw
Nonachlor, trans-	Total		50 - 150%			IIRMES	1	ng/g dw
Oxychlordane	Total		50 - 150%			IIRMES	1	ng/g dw
Toxaphene	Total		50 - 150%			IIRMES	1	
PCBs: Estuary Sediment								
PCB 003	Total	Reference Material (CRM, SRM or LCS) and Matrix	50 - 150 %	Laboratory Duplicate and Matrix Spike Duplicate - RPD <	90%	IIRMES	0.2	ng/g dw
PCB 008	Total					IIRMES	0.2	ng/g dw

Parameter	Fraction	Accuracy		Precision	Completeness	Laboratory	Target Reporting Limits	Units
		Requirements	Recovery					
PCB 018	Total	Spike		25%		IIRMES	0.2	ng/g dw
PCB 028	Total					IIRMES	0.2	ng/g dw
PCB 031	Total					IIRMES	0.2	ng/g dw
PCB 033	Total					IIRMES	0.2	ng/g dw
PCB 037	Total					IIRMES	0.2	ng/g dw
PCB 044	Total					IIRMES	0.2	ng/g dw
PCB 049	Total					IIRMES	0.2	ng/g dw
PCB 052	Total					IIRMES	0.2	ng/g dw
PCB 056	Total					IIRMES	0.2	ng/g dw
PCB 056/060	Total					IIRMES	0.2	ng/g dw
PCB 060	Total					IIRMES	0.2	ng/g dw
PCB 066	Total					IIRMES	0.2	ng/g dw
PCB 070	Total					IIRMES	0.2	ng/g dw
PCB 074	Total					IIRMES	0.2	ng/g dw
PCB 077	Total					IIRMES	0.2	ng/g dw
PCB 081	Total					IIRMES	0.2	ng/g dw
PCB 087	Total					IIRMES	0.2	ng/g dw
PCB 095	Total					IIRMES	0.2	ng/g dw
PCB 097	Total					IIRMES	0.2	ng/g dw
PCB 099	Total					IIRMES	0.2	ng/g dw
PCB 101	Total					IIRMES	0.2	ng/g dw
PCB 105	Total					IIRMES	0.2	ng/g dw
PCB 110	Total					IIRMES	0.2	ng/g dw
PCB 114	Total					IIRMES	0.2	ng/g dw
PCB 118	Total					IIRMES	0.2	ng/g dw
PCB 119	Total					IIRMES	0.2	ng/g dw
PCB 123	Total					IIRMES	0.2	ng/g dw

Parameter	Fraction	Accuracy		Precision	Completeness	Laboratory	Target Reporting Limits	Units
		Requirements	Recovery					
PCB 126	Total					IIRMES	0.2	ng/g dw
PCB 128	Total					IIRMES	0.2	ng/g dw
PCB 138	Total					IIRMES	0.2	ng/g dw
PCB 141	Total					IIRMES	0.2	ng/g dw
PCB 149	Total					IIRMES	0.2	ng/g dw
PCB 151	Total					IIRMES	0.2	ng/g dw
PCB 153	Total					IIRMES	0.2	ng/g dw
PCB 156	Total					IIRMES	0.2	ng/g dw
PCB 157	Total					IIRMES	0.2	ng/g dw
PCB 158	Total					IIRMES	0.2	ng/g dw
PCB 167	Total					IIRMES	0.2	ng/g dw
PCB 168	Total					IIRMES	0.2	ng/g dw
PCB 168/132	Total					IIRMES	0.2	ng/g dw
PCB 169	Total					IIRMES	0.2	ng/g dw
PCB 170	Total					IIRMES	0.2	ng/g dw
PCB 174	Total					IIRMES	0.2	ng/g dw
PCB 177	Total					IIRMES	0.2	ng/g dw
PCB 180	Total					IIRMES	0.2	ng/g dw
PCB 183	Total	Reference Material (CRM, SRM or LCS) and Matrix Spike	50 - 150 %	Laboratory Duplicate and Matrix Spike Duplicate - RPD < 25%	90%	IIRMES	0.2	ng/g dw
PCB 187	Total					IIRMES	0.2	ng/g dw
PCB 189	Total					IIRMES	0.2	ng/g dw
PCB 194	Total					IIRMES	0.2	ng/g dw
PCB 195	Total					IIRMES	0.2	ng/g dw
PCB 209	Total					IIRMES	0.2	ng/g dw
PAHs: Estuary Sediment		Reference Material (CRM, SRM or LCS) and Matrix Spike		Laboratory Duplicate and Matrix Spike Duplicate - RPD < 25%	90%			
Acenaphthene	Total		50 - 150%			IIRMES	5	ng/g dw
Acenaphthylene	Total		50 - 150%			IIRMES	5	ng/g dw

Parameter	Fraction	Accuracy		Precision	Completeness	Laboratory	Target Reporting Limits	Units
		Requirements	Recovery					
Anthracene	Total		50 - 150%			IIRMES	5	ng/g dw
Benz(a)anthracene	Total		50 - 150%			IIRMES	5	ng/g dw
Benzo(a)pyrene	Total		50 - 150%			IIRMES	5	ng/g dw
Benzo(b)fluoranthene	Total		50 - 150%			IIRMES	5	ng/g dw
Benzo(e)pyrene	Total		50 - 150%			IIRMES	5	ng/g dw
Benzo(g,h,i)perylene	Total		50 - 150%			IIRMES	5	ng/g dw
Benzo(k)fluoranthene	Total		50 - 150%			IIRMES	5	ng/g dw
Biphenyl	Total		50 - 150%			IIRMES	5	ng/g dw
Chrysene	Total		50 - 150%			IIRMES	5	ng/g dw
Dibenz(a,h)anthracene	Total		50 - 150%			IIRMES	5	ng/g dw
Dibenzothiophene	Total		50 - 150%			IIRMES	5	ng/g dw
Dimethylnaphthalene, 2,6-	Total		50 - 150%			IIRMES	5	ng/g dw
Fluoranthene	Total		50 - 150%			IIRMES	5	ng/g dw
Fluorene	Total		50 - 150%			IIRMES	5	ng/g dw
Indeno(1,2,3-c,d)pyrene	Total		50 - 150%			IIRMES	5	ng/g dw
Methylnaphthalene, 1-	Total		50 - 150%			IIRMES	5	ng/g dw
Methylnaphthalene, 2-	Total		50 - 150%			IIRMES	5	ng/g dw
Methylphenanthrene, 1-	Total		50 - 150%			IIRMES	5	ng/g dw
Naphthalene	Total		41 - 109%			IIRMES	5	ng/g dw
Perylene	Total		50 - 150%			IIRMES	5	ng/g dw
Phenanthrene	Total		50 - 150%			IIRMES	5	ng/g dw
Pyrene	Total		50 - 150%			IIRMES	5	ng/g dw
Trimethylnaphthalene, 2,3,5-	Total		50 - 150%			IIRMES	5	ng/g dw
Toxicity: Estuary Sediment								
Eohaustorius sp.	N/A	Meets EPA control response standards; DMR intralab results w/in criteria	N/A	Ref Tox ± 2 SD of preceding 20 tests	90%	ABC	N/A	Survival (%)
Mytilus Sediment Water Interface	N/A					ABC		Mortality/Normality (%)

Parameter	Fraction	Accuracy		Precision	Completeness	Laboratory	Target Reporting Limits	Units
		Requirements	Recovery					
Invertebrate Identifications: Estuary Sediment								
Sampling	N/A	≤10 seconds of nominal Lat/Long (300 m radius)	N/A	N/A	90%	ABC	1.0 seconds Lat/Long	N/A
Sorting	N/A	A minimum of 10% of all matriral will be resorted. Sorting accuracy within 5% (equivalent to 95% removal efficiency).	95 % Sorting Efficiency	N/A	90%	ABC	N/A	N/A

C-1.3 Method Detection Limit Studies

Any laboratory performing analyses under this program must routinely conduct MDL studies to document that the MDLs are less than or equal to the project-specified RLs. If any analytes have MDLs that do not meet the project RLs, the following steps must be taken:

- Perform a new MDL study using concentrations sufficient to prove analyte quantitation at concentrations less than or equal to the project-specified RLs per the procedure for the Determination of the Method Detection Limit presented in Revision 1.1, 40 Code of Federal Regulations (CFR) 136, 1984.
- No samples may be analyzed until the issue has been resolved. MDL study results must be available for review during audits, data review, or as requested. Current MDL study results must be reported for review and inclusion in project files.

An MDL is developed from seven aliquots of a standard containing all analytes of interest spiked at five times the expected MDL. These aliquots are processed and analyzed in the same manner as environmental samples. The results are then used to calculate the MDL. If the calculated MDL is less than 0.33 times the spiked concentration, another MDL study should be performed using lower spiked concentrations.

C-1.4 Project Reporting Limits

Laboratories generally establish RLs that are reported with the analytical results—these may be called reporting limits, detection limits, reporting detection limits, or several other terms by the reporting laboratory. These laboratory limits must be less than or equal to the project RLs listed in **Table C-2**. Wherever possible, project RLs are lower than the relevant numeric criteria or toxicity thresholds. Laboratories performing analyses for this project must have documentation to support quantitation at the required levels.

C-1.5 Laboratory Standards and Reagents

All stock standards and reagents used for standard solutions and extractions must be tracked through the laboratory. The preparation and use of all working standards must be documented according to procedures outlined in each laboratory's Quality Assurance (QA) Manual; standards must be traceable according to USEPA, A2LA or National Institute for Standards and Technology (NIST) criteria. Records must have sufficient detail to allow determination of the identity, concentration, and viability of the standards, including any dilutions performed to obtain the working standard. Date of preparation, analyte or mixture, concentration, name of preparer, lot or cylinder number, and expiration date, if applicable, must be recorded on each working standard.

C-1.6 Sample Containers, Storage, Preservation, and Holding Times

Sample containers must be pre-cleaned and certified free of contamination according to the USEPA specification for the appropriate methods. Sample container, storage and preservation, and holding time requirements are provided in **Table C-9**. The analytical laboratories will supply sample containers that already contain preservative (**Table C-9**), including ultra-pure hydrochloric and nitric acid, where applicable. After collection, samples will be stored at $4^{o}C$ until arrival at the contract laboratory.

Table C-9.
Sample Container, Sample Volume, Initial Preservation, and Holding Time Requirements for Parameters Analyzed at a Laboratory

Parameter	Sample Container	Sample Volume(1)	Immediate Processing and Storage	Holding Time
Water				
Toxicity				
Initial Screening	Glass or FLPD-lined jerrican	40 L	Store at 4°C	36 hours(2)
Follow-Up Testing				
Phase I TIE				
E. coli (fresh)	PE	120 mL	Na2S2O3 and Store at 4°C	8 hours
Oil and Grease	PE	250 mL	HCl and Store at 4°C	28 days
Chlorophyll a	Amber PE	1 L	Store at 4°C	Filter w/in 48 hours, 28 days
Cyanide	PE	1 L	NaOH and Store at 4°C	14 days
Dissolved Organic Carbon (DOC)	PE	250 mL	Store at 4°C	Filter/28 days
Total Organic Carbon (TOC)	PE	250 mL	H2SO4 and Store at 4°C	28 days
Total Petroleum Hydrocarbon	Glass	1 L	HCl or H2SO4 and Store at 4°C	7/40 days(3)
Biochemical Oxygen Demand	PE	1L	Store at 4°C	48 hours
Chemical Oxygen Demand	PE	500 mL	H2SO4 and Store at 4°C	28 days
MBAS	PE	1 L	Store at 4°C	48 hours
Fluoride	PE	500 mL	None required	28 days
Chloride	PE	250 mL	Store at 4°C	28 days
Sulfate				28 days
Boron	PE	250-mL	Store at 4°C	180 days
Perchlorate	PE	500 mL	Store at 4°C	28 days
Nitrate Nitrogen	PE	250 mL	Store at 4°C	48 hours
Nitrite Nitrogen				
Orthophosphate-P				
Ammonia Nitrogen	Glass	250-mL	H2SO4 and Store at 4°C	28 days
Total and Dissolved Phosphorus				
Organic Nitrogen				
Nitrate + Nitrite (as N)				
Total Kjehdahl Nitrogen (TKN)	PE	250 mL	H2SO4 and Store at	28 days

Parameter	Sample Container	Sample Volume(1)	Immediate Processing and Storage	Holding Time
			4°C	
Total Alkalinity	PE	500 mL	Store at 4°C	14 days
Suspended Sediment Concentration (SSC)	PE	250 mL	Store at 4°C	120 days
Total Suspended Solids (TSS)	PE	250 mL	Store at 4°C	7 days
Total Dissolved Solids (TDS)	PE	250 mL	Store at 4°C	7 days
Volatile Suspended Solids	PE	250 mL	Store at 4°C	7 days
Hardness	PE	500 mL	Store at 4°C	180 days
Metals				6 months(4)
Mercury	Glass	500 mL	Store at 4°C	48 Hours
Dioxin	Amber glass	2 x 1 L	Store at 4°C	1 year
PCBs, OC Pesticides, OP Pesticides,Triazine Pesticides	Amber glass	4 x 1 L	Store at 4°C	7/40 days(3)
Suspended Solids Analysis for Organics and Metals	Amber glass	20 x 1 L	Store at 4°C	1 year(5)
Herbicides	Glass	2 x 40 mL	Thiosulfate and Store at 4°C	14 days
Semivolatile Organic Compounds	Glass	2 x 1 L	Store at 4°C	7 days
Volatile Organic Compounds	VOA	3 x 40 mL	HCl and Store at 4°C	14 days
Sediment				
% Solids	Glass	2 x 8 oz jar	Store at 4°C	7 days
Total Organic Carbon (TOC)				1 year(6)
OC Pesticides, PCBs, PAHs				1 year(5)
Metals				
Tissue				
% Lipids	teflon sheet	200 g	Store on dry ice	1 year(5)
Chlordane				
DDTs				
Dieldrin				

PE – Polyethylene

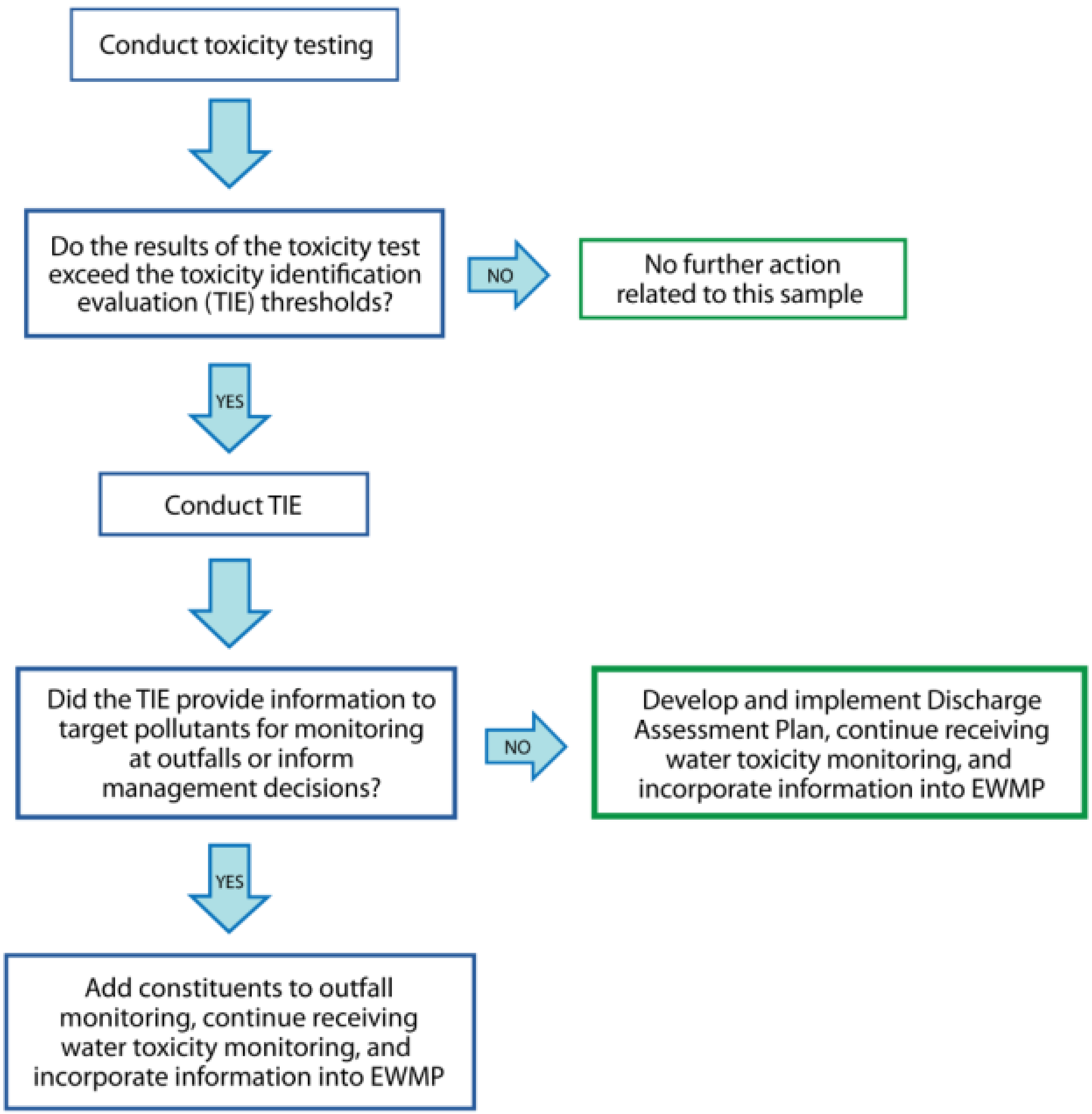
1. Additional volume may be required for QC analyses.
2. Tests should be initiated within 36 hours of collection. The 36-hour hold time does not apply to subsequent analyses for TIEs. For interpretation of toxicity results, samples may be split from toxicity samples in the laboratory and analyzed for specific chemical parameters. All other sampling requirements for these samples are as specified in this document for the specific analytical method. Results of these analyses are not for any other use (e.g., characterization of ambient conditions) because of potential holding time exceedances and variance from sampling requirements.
3. 7/40 = 7 days to extract and 40 days from extraction to analysis.
4. 6 months after preservation.
5. One year if frozen, otherwise 14 days to extract and 40 days from extraction to analysis.
6. One year if frozen, otherwise 28 days.

C-1.7 Aquatic Toxicity Testing and Toxicity Identification Evaluations

Aquatic toxicity testing supports the identification of BMPs to address sources of toxicity in urban runoff. The following outlines the approach for conducting aquatic toxicity monitoring and evaluating results. Control measures and management actions to address confirmed toxicity caused by urban runoff are addressed by the EWMP, either via currently identified management actions or those that are identified via adaptive management of the EWMP.

The approach to conducting aquatic toxicity monitoring is presented in **Figure C-1**, which describes a general evaluation process for each sample collected as part of routine sampling conducted twice per year in wet weather and once per year in dry weather. Monitoring begins in the receiving water and the information gained is used to identify constituents for monitoring at outfalls to support the identification of pollutants that need to be addressed in the EWMP. The sub-sections below describe the detailed process and its technical and logistical rationale.

Figure C-1.
Generalized Aquatic Toxicity Assessment Process



C-1.7.1 Sensitive Species Selection

The MRP (page D-32) states that a sensitivity screening to select the most sensitive test species should be conducted unless "a sensitive test species has already been determined, or if there is prior knowledge of potential toxicant(s) and a test species is sensitive to such toxicant(s), then monitoring shall be conducted using only that test species." Previous relevant studies conducted in the watershed should be considered. Such studies may have been completed via previous MS4 sampling, wastewater NPDES sampling, or special studies conducted within the watershed. The following discuss the species selection process for assessing aquatic toxicity in receiving waters.

As described in the MRP (page D-31), if samples are collected in receiving waters with salinity less than 1 part per thousand (ppt), or from outfalls discharging to receiving waters with salinity less than 1 ppt, toxicity tests should be conducted on the most sensitive test species in accordance with species and short-term test methods in Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms (EPA/821/R-02/013, 2002; Table IA, 40 CFR Part 136). The freshwater test species identified in the MRP are:

- A static renewal toxicity test with the fathead minnow, *Pimephales promelas* (Larval Survival and Growth Test Method 1000.04).
- A static renewal toxicity test with the daphnid, *Ceriodaphnia dubia* (Survival and Reproduction Test Method 1002.05).
- A static renewal toxicity test with the green alga, *Selenastrum capricornutum* (also named *Raphidocelis subcapitata*) (Growth Test Method 1003.0).

The three test species were evaluated to determine if either a sensitive test species had already been determined, or if there is prior knowledge of potential toxicant(s) and a test species is sensitive to such toxicant(s). In reviewing the available data in the watershed, metals, historical organics, and currently used pesticides have been identified as problematic and are generally considered the primary aquatic life toxicants of concern found in urban runoff. Given the knowledge of the presence of these potential toxicants in the watershed, the sensitivities of each of the three species were considered to evaluate which is the most sensitive to the potential toxicants in the watershed.

Ceriodaphnia dubia (*C. dubia*) has been reported as a sensitive test species for historical and current use of pesticides and metals, and studies indicate that it is more sensitive to the toxicants of concern than *Pimephales promelas* (*P. promelas*) or *Selenastrum capricornutum* (*S. capricornutum*). In *Aquatic Life Ambient Freshwater Quality Criteria - Copper*, the USEPA reports greater sensitivity of *C. dubia* to copper (species mean acute value of 5.93 µg/l) compared to *P. promelas* (species mean acute value of 69.93 µg/l; EPA, 2007). *C. dubia*'s relatively higher sensitivity to metals is common across multiple metals. Additionally, researchers at the University of California (UC), Davis reviewed available reported species sensitivity values in developing pesticide criteria for the Central Valley Regional Water Quality Control Board. The UC Davis researchers reported higher sensitivity of *C. dubia* to diazinon and bifenthrin (species mean acute value of 0.34 µg/l and 0.105 µg/l) compared to *P. promelas* (species mean acute value of 7804 µg/l and 0.405 µg/l; Palumbo et al., 2010a,b). Additionally, a study of the City of Stockton urban stormwater runoff found acute and chronic toxicity to *C. dubia*, with no toxicity to *S. capricornutum* or *P. promelas* (Lee and Lee, 2001). The toxicity was attributed to organophosphate pesticides, indicating a higher sensitivity of *C. dubia* compared to *S. capricornutum* or *P. promelas*. *C. dubia* is also the test organism selected to assess the ambient toxicity of the Los Angeles River by the Los Angeles River Watershed Monitoring Program and has been the most-sensitive species to the Donald C. Tillman and the Los Angeles-Glendale Water Reclamation Plant effluent as well as the Los Angeles River receiving water in the vicinity of the water treatment plants. While *P. promelas* is generally less sensitive to metals and pesticides, this species can be more sensitive to ammonia than *C. dubia*. However, as ammonia is not typically a constituent of concern for urban runoff and ammonia is not consistently observed above the toxic thresholds in the watershed, *P. promelas* is not considered a particularly sensitive species for evaluating the impacts of urban runoff in receiving waters in the watershed.

S. capricornutum is a species sensitive to herbicides. However, while sometimes present in urban runoff, herbicides are not identified as a potential toxicant in the watershed. Additionally, *S. capricornutum* is not considered the most sensitive species as it is not sensitive to pyrethroids or organophosphate pesticides and is not as sensitive to metals as *C. dubia*. Additionally, the *S. capricornutum* growth test can be affected by high concentrations of suspended and dissolved solids, color, and pH extremes, which can interfere with the determination of sample toxicity. As a result, it is common to manipulate the sample by centrifugation and filtration to remove solids to conduct the test; however, this process may affect the toxicity of the sample. In a study of urban highway stormwater runoff (Kayhanian et. al, 2008), *S. capricornutum* response to the stormwater samples was more variable than the *C. dubia* and the *P. promelas* and in some cases the algal growth was possibly enhanced due to the presence of stimulatory nutrients. Also, in a study on the City of Stockton urban stormwater runoff (Lee and Lee, 2001) the *S. capricornutum* tests rarely detected toxicity where the *C. dubia* and the *P. promelas* regularly detected toxicity.

As *C. dubia* is identified as the most sensitive to known potential toxicant(s) typically found in receiving waters and urban runoff in the freshwater potions of the watershed, *C. dubia* is selected as the most sensitive species. The species also has the advantage of being easily maintained in house mass cultures. The simplicity of the test, the ease of interpreting results, and the smaller volume necessary to run the test, make the test a valuable screening tool. The ease of sample collection and higher sensitivity will support assessing the presence of ambient receiving water toxicity or long-term effects of toxic stormwater over time. As such, toxicity testing in the freshwater portions of the watershed will be conducted using *C. dubia*. However, *C. dubia* test organisms are typically cultured in moderately hard waters (80-100 mg/L CaCO3) and can have increased sensitivity to elevated water hardness greater than 400 mg/L CaCO3), which is beyond their typical habitat range. Because of this, in instances where hardness in site waters exceeds 400 mg/L (CaCO3), an alternative test species may be used. *Daphnia magna* is more tolerant to high hardness levels and is a suitable substitution for *C. dubia* in these instances (Cowgill and Milazzo, 1990).

C-1.7.2 Testing Period

The following describes the testing periods to assess toxicity in samples collected in the EWMP area during dry and wet weather conditions. As wet weather conditions in the region generally persist for less than the acute and chronic testing periods (typically 48 hours and 7 days, respectively), the shorter of the two testing methods, in the case of *C. dubia* acute testing measuring survival, will be used for wet weather toxicity testing. Because storm events are short duration, chronic tests performed on wet weather samples are not representative of the conditions found in the receiving water. Acute toxicity tests are consistent with the relatively shorter exposure periods of species in the EWMP area to potential toxicants introduced by urban runoff during storm events. Acute testing to assess survival endpoints will be conducted in accordance with *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* (EPA, 2002b).

Chronic toxicity tests will be used to assess both survival and reproductive/growth endpoints for *C. dubia* in dry weather samples. Chronic testing will be conducted on undiluted samples in accordance with *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (USEPA, 2002a).

C-1.7.3 Toxicity Endpoint Assessment and Toxicity Identification Evaluation Triggers

Per the MRP, acute and chronic toxicity test endpoints will be analyzed using the Test of Significant Toxicity (TST) t-test approach specified by the USEPA (USEPA, 2010). The Permit specifies that the chronic in-stream waste concentration (IWC) is set at 100% receiving water for receiving water samples and 100% effluent for outfall samples. Using the TST approach, a t-value is calculated for a test result and compared with a critical t-value from USEPA's TST Implementation Document (USEPA, 2010). Follow-up triggers are generally based on the Permit specified statistical assessment as described below.

For acute *C. dubia* toxicity testing, if a statistically significant 50% difference in mortality is observed between the sample and laboratory control, a toxicity identification evaluation (TIE) will be performed. TIE procedures are discussed in detail in the following subsection. Experience in conducting TIEs in receiving waters in the region supports using a 50% mortality trigger to provide a reasonable opportunity for a successful TIE. During TMDL monitoring in the Calleguas Creek Watershed (CCW) in 2003 and 2004, TIEs were initiated on samples exceeding the 50% threshold (the majority of which displayed 100% mortality). In that study, toxicity degraded in approximately 40% of the samples on which TIE procedures were conducted making the TIE unsuccessful (and effectively useless in pinpointing specific toxicants). The Regional Board approved monitoring program for the CCW Toxicity, Chlorpyrifos and Diazinon TMDL utilizes a 50% threshold for TIE initiation. Additionally, a 50% mortality threshold is utilized in the Ventura County MS4 Permit.

For chronic *C. dubia* toxicity testing, if a statistically significant 50% difference in mortality is observed between the sample and laboratory control, a TIE will be performed. If a statistically significant 50% difference in a sub-lethal endpoint is observed between the sample and laboratory control, a confirmatory sample will be collected from the receiving water within two weeks of obtaining the results of the initial sample. If a statistically significant 50% difference in mortality or sub-lethal endpoint is observed between the sample and laboratory control on the confirmatory sample, a TIE will be performed.

For the chronic marine and estuarine tests, the percent effect will be calculated. The percent effect is defined as the difference between the mean control response and the mean IWC response divided by the control response, multiplied by 100. A TIE will be performed if the percent effect value is equal to or greater than 50 percent.

TIE procedures will be initiated as soon as possible after the toxicity trigger threshold is observed to reduce the potential for loss of toxicity due to extended sample storage. If the cause of toxicity is readily apparent or is caused by pathogen related mortality or epibiont interference with the test, the result will be rejected. If necessary, a modified testing procedure will be developed for future testing.

In cases where significant endpoint toxicity effects greater than 50% are observed in the original sample, but the follow-up TIE positive control "signal" is not statistically significant, the cause of toxicity will be considered non-persistent. No immediate follow-up testing is required on the sample. However, future test results should be evaluated to determine if parallel TIE treatments are necessary to provide an opportunity to identify the cause of toxicity

C-1.7.4 Toxicity Identification Evaluation Approach

The results of toxicity testing will be used to trigger further investigations to determine the cause of observed laboratory toxicity. The primary purpose of conducting TIEs is to support the identification of management actions that will result in the removal of pollutants causing toxicity in receiving waters. Successful TIEs will direct monitoring at outfall sampling sites to inform management actions. As such, the goal of conducting TIEs is to identify pollutant(s) that should be sampled during outfall monitoring so that management actions can be identified to address the pollutant(s).

The TIE approach is divided into three phases as described in USEPA's 1991 Methods for Aquatic Toxicity Identification Evaluations – Phase I Toxicity Characterization Procedures – Second Edition (EPA/600/6-9/003) and briefly summarized as follows:

- Phase I utilizes methods to characterize the physical/chemical nature of the constituents that cause toxicity. Such characteristics as solubility, volatility and filterability are determined without specifically identifying the toxicants. Phase I results are intended as a first step in specifically identifying the toxicants but the data generated can also be used to develop treatment methods to remove toxicity without specific identification of the toxicants.
- Phase II utilizes methods to specifically identify toxicants.
- Phase III utilizes methods to confirm the suspected toxicants.

A Phase I TIE will be conducted on samples that exceed a TIE trigger described above. Water quality data will be reviewed to future support evaluation of potential toxicants. TIEs will perform the manipulations described in **Table C-10**. TIE methods will generally adhere to USEPA procedures documented in conducting TIEs (USEPA, 1991, 1992, 1993a-b).

Table C-10.
Aquatic Toxicity Identification Evaluation Sample Manipulations

TIE Sample Manipulation	Expected Response
pH Adjustment (pH 7 and 8.5)	Alters toxicity in pH sensitive compounds (i.e., ammonia and some trace metals)
Filtration or centrifugation	Removes particulates and associated toxicants
Ethylenedinrilo-Tetraacetic Acid (EDTA)	Chelates trace metals, particularly divalent cationic metals
Sodium thiosulfate (STS) addition	Reduces toxicants attributable to oxidants (i.e., chlorine) and some trace metals
Piperonyl Butoxide (PBO)	Reduces toxicity from organophosphate pesticides such as diazinon, chlorpyrifos and malathion, and enhances pyrethroid toxicity
Carboxylesterase addition(1)	Hydrolyzes pyrethroids
Solid Phase Extraction (SPE) with C18 column	Removes non-polar organics (including pesticides) and some relatively non-polar metal chelates
Sequential Solvent Extraction of C18 column	Further resolution of SPD-extracted compounds for chemical analyses
No Manipulation	Baseline test for comparing the relative effectiveness of other manipulations

1. Carboxylesterase addition has been used in recent studies to help identify pyrethroid-associated toxicity (Wheelock et al., 2004; Weston and Amweg, 2007). However, this treatment is experimental in nature and should be used along with other pyrethroid-targeted TIE treatments (e.g., PBO addition).

The USGR EWMP Group will identify the cause(s) of toxicity using the treatments in **Table C-10** and, if possible, using the results of water column chemistry analyses. After any initial determinations of the cause of toxicity, the information may be used during future events to modify the targeted treatments to more closely target the expected toxicant or to provide additional treatments to narrow the toxicant cause(s). Moreover, if the toxicant or toxicant class is not initially identified, toxicity monitoring during subsequent events will confirm if the toxicant is persistent or a short-term episodic occurrence.

As the primary goals of conducting TIEs is to identify pollutants for incorporation into outfall monitoring, narrowing the list of toxicants following Phase I TIEs via Phase II or III TIEs is not necessary if the toxicant class determined during the Phase I TIE is sufficient for: (1) identifying additional pollutants for outfall monitoring; and/or (2) identifying control measures. Thus, if the specific pollutant(s) or the analytical class of pollutant (e.g., metals that are analyzed via USEPA Method 200.8) are identified then sufficient information is available to inform the addition of pollutants to outfall monitoring.

Phase II TIEs may be utilized to identify specific constituents causing toxicity in a given sample if information beyond what is gained via the Phase I TIE and review of chemistry data is needed to identify constituents to monitor or management actions. Phase III TIEs will be conducted following any Phase II TIEs.

For the purposes of determining whether a TIE is inconclusive, TIEs will be considered inconclusive if:

- The toxicity is persistent (i.e., observed in the positive control), and

- The cause of toxicity cannot be attributed to a class of constituents (e.g., insecticides, metals, etc.) that can be targeted for monitoring.

If (1) a combination of causes that act in a synergistic or additive manner are identified; (2) the toxicity can be removed with a treatment or via a combination of the TIE treatments; or (3) the analysis of water quality data collected during the same event identify the pollutant or analytical class of pollutants, the result of a TIE is considered conclusive.

Note that the MRP (page D-33) allows a TIE Prioritization Metric (as described in Appendix E of the Southern California Stormwater Monitoring Coalition's (SMC) Model Monitoring Program) for use in ranking sites for TIEs. However, as the extent to which TIEs will be conducted is unknown, prioritization cannot be conducted at this time. However, prioritization may be utilized in the future based on the results of toxicity monitoring and an approach to prioritization will be developed through the CIMP adaptive management process and will be described in future Annual Reports.

C-1.7.5 Discharge Assessment

The USGR EWMP Group will prepare a Discharge Assessment Plan (DAP) if TIEs conducted on consecutive sampling events are inconclusive. Discharge assessments will be conducted after consecutive inconclusive TIEs, rather than after one, because of the inherit variability associated with the toxicity and TIE testing methods.

The DAP will consider the observed potential toxicants in the receiving water and associated urban runoff discharge above known species effect levels and the relevant exposure periods compared to the duration of the observed toxicity. The DAP will identify:

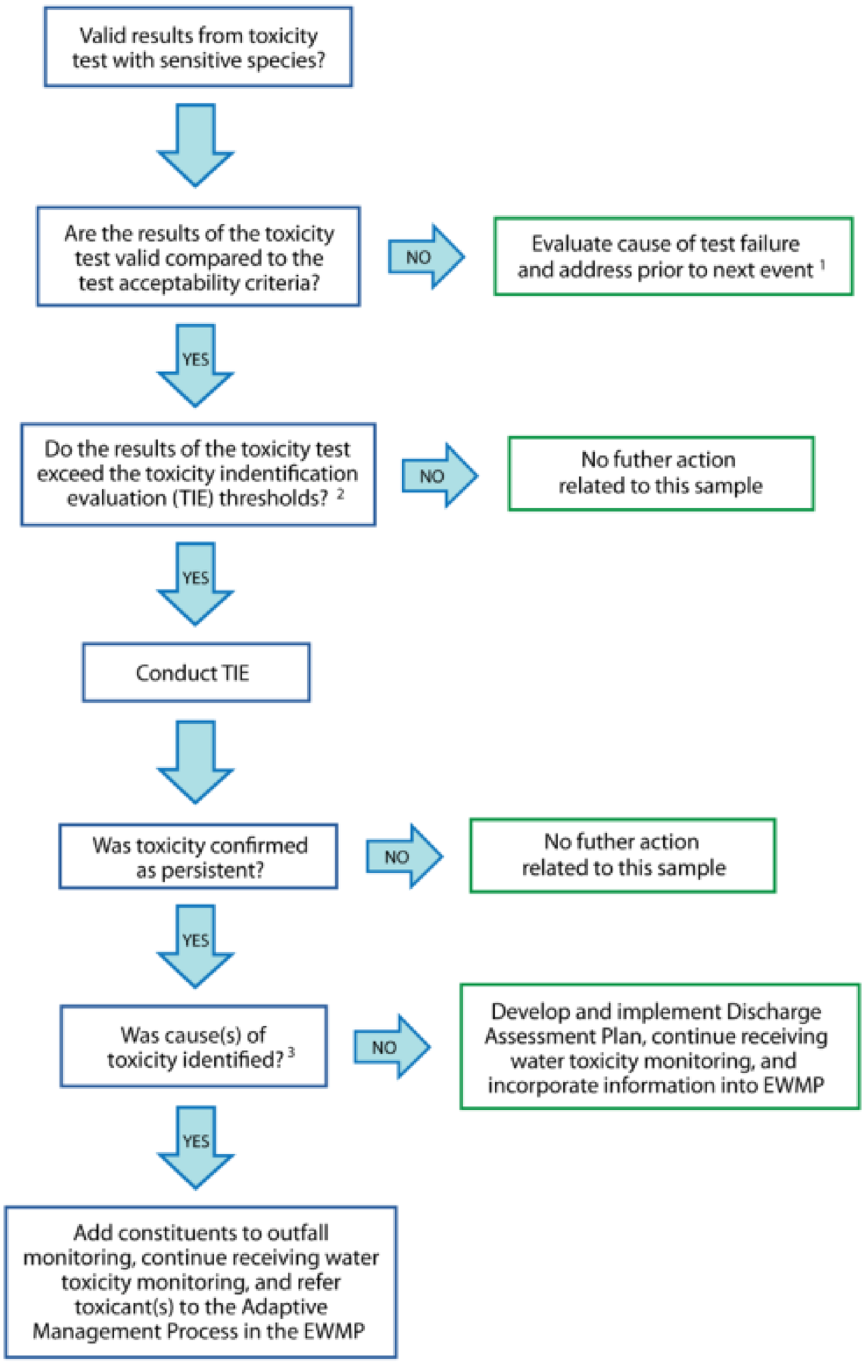
1. If desired, additional receiving water toxicity monitoring to be conducted to further evaluate the spatial extent of receiving water toxicity.
2. The test species to be utilized. If a species is proposed that is different than the species utilized when receiving water toxicity was observed, justification for the substitution will be provided.
3. The number and location of monitoring sites and their spatial relation to the observed receiving water toxicity.
4. The number of monitoring events that will be conducted, a schedule for conducting the monitoring, and a process for evaluating the completion of the assessment monitoring.

The DAP will be submitted to Regional Board with the semi-annual data report submitted at least 60 days from receipt of notification of the second consecutive inconclusive result. If no comments are received within 30 days from submittal, it will be assumed that the approach is appropriate for the given situation and the DAP will be implemented within 90-days of submittal. If comments are received within 30 days, the DAP will be resubmitted to Regional Board staff and the Plan will be implemented within 90-days of submittal of a version of the Plan that does not receive comments from Regional Board staff.

C-1.7.6 Summary of Aquatic Toxicity Monitoring

The approach to conducting aquatic toxicity monitoring as described in the previous sections of this Attachment is summarized in detail in **Figure C-2.** The intent of the approach is to identify the cause of toxicity observed in receiving water to the extent possible with the toxicity testing tools available, thereby directing outfall monitoring for the pollutants causing toxicity with the ultimate goal of supporting the development and implementation of management actions.

Figure C-2.
Detailed Aquatic Toxicity Assessment Process



1. Test failure includes pathogen or epibont interference, which should be addressed prior to the next toxicity sampling event.
2. For freshwater, the TIE threshold is equal to or greater than 50% (≥50%) mortality in an acute (wet weather) or chronic (dry weather) test. If a ≥50% effect in a sub-lethal endpoint for chronic test is observed during dry weather, a follow up sample will

be collected within two weeks of the completion of the initial sample collection. If the follow up sample exhibits a ≥50% effect, a TIE will be initiated.

3. The goal of conducting Phase I TIEs is to identify the cause of toxicity so that outfall monitoring can incorporate the toxicant(s) into the list of constituents monitored during outfall monitoring. Thus, if specific toxicant(s) or the analytical class of toxicants (i.e., metals that are analyzed via EPA Method 200.8) are identified, sufficient information is available to inform the addition of pollutants to the list of pollutants monitored during outfall monitoring.

C-1.8 Bio-Assessment/Macrobenthic Community Assessment

The LACFCD has indicated that it will continue its participation in the SMC Regional Bioassessment Monitoring Program on behalf of all MS4 Permittees. Thus no specific monitoring and analytical procedures are included in the CIMP at this time. If in the future, such monitoring is necessary under this program, the CIMP will be revised to include appropriate procedures.

C-1.8.1 List of Laboratories Conducting Analysis

The chosen laboratories will be able to meet the measurement quality objectives set forth in **Table C-2** through **Table C-5**. Laboratories will meet California Environmental Laboratory Accreditation Program (ELAP) and/or National Environmental Laboratory Accreditation Program (NELAP) certifications and any data quality requirements specified in this document. Due to contracting procedures and solicitation requirements, qualified laboratories have not yet been selected to carry out the analytical responsibilities described in this CIMP. Selected laboratories will be listed along with lab certification information in **Table C-11**. Following the completion of the first monitoring year, the CIMP will be updated to include the pertinent laboratory specific information. At the end of all future monitoring years the USGR EWMP Group will assess the laboratories performance and at that time a new laboratory may be chosen.

Table C-11.
Summary of Laboratories Conducting Analysis for the USGR CIMP

Laboratory[1]	General Category of Analysis	Lab Certification No. & Expiration Date[2]

1. Information for all laboratories will be added to this table following their selection and upon CIMP update.
2. Lab certifications are renewed on an annual basis.

In the event that the laboratories selected to perform analyses for the CIMP are unable to fulfill data quality requirements outlined herein (e.g., due to instrument malfunction), alternate laboratories need to meet the same requirements that the primary labs have met. The original laboratory selected may recommend a qualified laboratory to act as a substitute. However, the final decision regarding alternate laboratory selection rests with the USGR EWMP Group.

C-2 SAMPLING METHOD AND SAMPLE HANDLING

The following sections describe the steps to be taken to properly prepare for and initiate water quality sampling for the CIMP.

C-2.1 Monitoring Event Preparation

Monitoring event preparation includes preparation of field equipment, placing bottle orders, and contacting the necessary personnel regarding site access and schedule. The following steps will be completed two weeks prior to each sampling event (a condensed timeline may be appropriate in storm events, which may need to be completed on short notice):

1. Contact laboratories to order sample containers and to coordinate sample transportation details.
2. Confirm scheduled monitoring date with field crew(s), and set-up sampling day itinerary including sample drop-off.
3. Prepare equipment.
4. Prepare sample container labels and apply to bottles.
5. Prepare the monitoring event summary and field log sheets to indicate the type of field measurements, field observations and samples to be collected at each of the monitoring sites.
6. Verify that field measurement equipment is operating properly (i.e., check batteries, calibrate, etc.)

Table C-12 provides a checklist of field equipment to prepare prior to each monitoring event.

Table C-12.
Field Equipment Checklist

☐	Monitoring Plan
☐	Sample Containers plus Extras with Extra Lids
☐	Pre-Printed, Waterproof Labels (extra blank sheets)
☐	Event Summary Sheets
☐	Field Log Sheets
☐	Chain of Custody Forms
☐	Bubble Wrap
☐	Coolers with Ice
☐	Tape Measure
☐	Paper Towels or “Rags in a Box”
☐	Safety Equipment
☐	First Aid Kit
☐	Cellular Telephone
☐	Gate Keys
☐	Hip Waders
☐	Plastic Trash Bags
☐	Sealable Plastic Bags
☐	Grab Pole
☐	Clean Secondary Container(s)
☐	Field Measurement Equipment
☐	New Powder-Free Nitrile Gloves
☐	Writing Utensils
☐	Stop Watch
☐	Camera
☐	Blank Water

C-2.1.1 Bottle Order/ Preparation

Sample container orders will be placed with the appropriate analytical laboratory at least two weeks prior to each sampling event. Containers will be ordered for all water samples, including quality control samples, as well as extra containers in case the need arises for intermediate containers or a replacement. The containers must be the proper type and size and contain preservative as appropriate for the specified laboratory analytical methods. **Table C-9** presents the proper container type, volume, and immediate processing and storage needs. The field crew must inventory sample containers upon receipt from the laboratory to ensure that adequate containers have been provided to meet analytical requirements for each monitoring event. After each event, any bottles used to collect water samples will be cleaned by the laboratory and either picked up by or shipped to the field crew.

C-2.1.2 Container Labeling and Sample Identification Scheme

All samples will be identified with a unique identification code to ensure that results are properly reported and interpreted. Samples will be identified such that the site, sampling location, matrix, sampling equipment and sample type (i.e., environmental sample or QC sample) can be distinguished by a data reviewer or user. Sample identification codes will consist of a site identification code, a matrix code, and a unique sample identification code. The format for sample identification codes is USGR- ###.# - AAAA - XXX, where:

- USGR indicates that the sample was collected as part of the USGR CIMP.
- ###- identifies the sequentially numbered monitoring event, and the # is an optional indicator for re-samples collected for the same event. Sample events are numbered from 001 to 999 and will not be repeated.
- AAAA indicates the unique site ID for each site.
- XXX identifies the sample number unique to a sample bottle collected for a single event. Sample bottles are numbered sequentially from 001 to 999 and will not be repeated within a single event.

Custom bottle labels should be produced using blank waterproof labels and labeling software. This approach will allow the site and analytical constituent information to be entered in advance and printed as needed prior to each monitoring event. Labels will be placed on the appropriate bottles in a dry environment; applying labels to wet sample bottles should be avoided. Labels should be placed on sides of bottles rather than on bottle caps. All sample containers will be pre-labeled before each sampling event to the extent practicable. Pre-labeling sample containers simplifies field activities, leaving only sample collection time and date and field crew initials to be filled out in the field. Labels should include the following information:

Program Name	Date	Analytical Requirements
Station ID	Collection Time	Preservative Requirements
Sample ID	Sampling Personnel	Analytical Laboratory

C-2.1.3 Field Meter Calibration

Calibration of field measurement equipment is performed as described in the owner’s manuals for each individual instrument. Each individual field crew will be responsible for calibrating their field measurement equipment. Field monitoring equipment must meet the requirements outlined in **Table D-6** and be calibrated before field events based on manufacturer guidance, but at a minimum prior to each event. **Table C-13** outlines the typical field instrument calibration procedures for each piece of equipment requiring calibration. Each calibration will be documented on each event’s calibration log sheet.

If calibration results do not meet manufacturer specifications, the field crew should first try to recalibrate using fresh aliquots of calibration solution. If recalibration is unsuccessful, new calibration solution should be used and/or maintenance should be performed. Each attempt should be recorded on the equipment calibration log. If the calibration results cannot meet manufacturer’s specifications, the field crew should use a spare field measuring device that can be successfully calibrated. If a spare field measuring device that can be successfully calibrated is unavailable, field crews shall note the use of unsuccessfully calibrated equipment on each appropriate field log sheet. Additionally, the USGR EWMP Group should be notified.

Calibration should be verified using at least one calibration fluid within the expected range of field measurements, both immediately following calibration and at the end of each monitoring day. Individual parameters should be recalibrated if the field meters do not measure a calibration fluid within the range of accuracy presented in **Table D-6**. Calibration verification documentation will be retained in the event's calibration verification log (presented in **Appendix 1**).

Table C-13.
Calibration of Field Measurement Equipment

Equipment / Instrument	Calibration and Verification Description	Frequency of Calibration	Frequency of Calibration Verification	Responsible Party
pH Probe	Calibration for pH measurement is accomplished using standard buffer solutions. Analysis of a mid-range buffer will be performed to verify successful calibration.	Day prior to 1st day or 1st day of sampling event	After calibration and at the end of each sampling day	Individual Sampling Crews
Temperature	Temperature calibration is factory-set and requires no subsequent calibration.			
Dissolved Oxygen Probe	Calibration for dissolved oxygen measurements is accomplished using a water saturated air environment. Dissolved oxygen (DO) measurement of water-saturated air will be performed and compared to a standard table of DO concentrations in water as a function of temperature and barometric pressure to verify successful calibration.			
Conductivity	Conductivity calibration will follow manufacturer's specifications. A mid-range conductivity standard will be analyzed to verify successful calibration.			
Turbidity	Turbidity calibration will follow manufacturer's specifications. A mid-range turbidity standard will be analyzed to verify successful calibration.			

C-2.1.4 Weather Conditions

Monitoring will occur during dry and wet conditions. Dry weather is defined in the MRP as when the flow of the receiving water body is less than 20 percent greater than the base flow or as defined by effective TMDLs within the watershed. Wet weather conditions are defined in the MRP as when the receiving water body has flow that is at least 20 percent greater than its base flow or as defined by effective TMDLs within the watershed.

Note that if rainfall begins after dry weather monitoring has been initiated, then dry weather monitoring will be suspended and continued on a subsequent day when weather conditions meet the dry weather conditions. Generally, grab samples will be collected during dry weather and composite samples will be collected during wet weather. Grab samples will be used for dry weather sampling events because the composition of the receiving water will change less over time; and thus, the grab sample can sufficiently characterize the receiving water. Grab samples during dry weather are consistent with similar programs within the region. However, to sufficiently characterize the receiving water during wet weather, composite samples will generally be used for wet weather sampling events. Grab samples may be utilized to collect wet weather sampling in certain situations, which may include, but are not limited to, when the constituent of interest requires the use of grab samples (e.g., *E. coli* and oil and grease), situations where it is unsafe to collect composite samples, or to perform investigative monitoring where composite sampling or installation of an automatic sample compositor (autosampler) may not be warranted.

The MRP includes specific criteria for the time of monitoring events. With the exception of bacteria and metals monitoring, most constituents will be monitored during two dry weather monitoring events. For dry weather toxicity monitoring, sampling must take place during the historically driest month. As a result, the dry weather monitoring event that includes toxicity monitoring will be conducted in July. The second dry weather monitoring event will take place during January unless sampling during another month is deemed to be preferable.

The first significant rain event of the storm year (first flush) will be monitored. The targeted storm events for wet weather sampling will be selected based on a reasonable probability that the events will result in substantially increased flows in the San Gabriel River over at least 12 hours. Sufficient precipitation is needed to produce runoff and increase flow. The decision to sample a storm event will be made in consultation with weather forecasting information services after a quantitative precipitation forecast (QPF) has been determined. All efforts will be made to collect wet weather samples from all sites during a single targeted storm event. However, safety or other factors may make it infeasible to collect samples from a given storm event. For example, storm events that will require field crews to collect wet weather samples during holidays and/or weekends may not be sampled due to sample collection or laboratory staffing constraints.

For a storm to be tracked, the first flush event will have a predicted rainfall of at least 0.25 inches with at least a 70 percent probability of rainfall 24 hours prior to the forecasted time of initial rainfall. Subsequent storm events must meet the tracking requirements, flow objectives, as well as be separated by a minimum of three days of dry weather. Antecedent conditions will be based on the LA County Department of Public Works (LACDPW) rain gage listed in **Table C-14**. The rain gage has been used to define wet and dry weather during TMDL monitoring in the watershed since 2009. Data can be obtained at http://dpw.lacounty.gov/wrd/Precip/index.cfm by clicking the ‘See Data’ link in the “Near Real-Time Precipitation Map” section. The web page displays a map showing real-time rainfall totals (in inches) for different rain gages. Although the default precipitation period is 24 hours, the user can view rainfall totals over different durations. Data from the rain gages is updated every 10 minutes.

Table C-14.
Real-Time Rain Gage Used to Define Weather Conditions for CIMP Monitoring(1)

Rainfall Gage	Operator	Gage Type	Latitude	Longitude
University of Southern California (USC) (375)	Los Angeles County Department of Public Works	Manually Observed Non-Mechanical Rain Gage	34.0226	-118.2908

1. Information for the gage can be found at http://dpw.lacounty.gov/wrd/Precip/alertlist.cfm.

The targeted storm events for wet weather sampling will be selected based on a reasonable probability that the events will result in substantially increased flows in the San Gabriel River for at least 12 hours. Sufficient precipitation is needed to produce runoff and increase flow. The decision to sample a storm event will be made in consultation with weather forecasting information services after a quantitative precipitation forecast (QPF) has been determined. All efforts will be made to collect wet weather samples from all sites during a single targeted storm event. However, safety or other factors may make it infeasible to collect samples from the same storm event.

For the purpose of triggering wet weather sampling preparation, field staff can estimate that any rainfall prediction for downtown Los Angeles of 0.1-0.5 inches in a 6- to 12-hour period would be sufficient to mobilize for wet weather sampling, or by utilizing the analyses of the CMP staff. The sampling crew should prepare to depart at the forecasted time of initial rainfall. The first of the four manual composite samples should be targeted for collection within 2 hours of local rainfall.

Publicly available meteorological forecasting systems are suggested for identifying and anticipating storm event sampling for the Study. The sampling decision protocol begins when the sampling crew recognizes an approaching storm, through weekly monitoring of forecasts. The National Weather Service's weather forecast for downtown Los Angeles can be accessed on-line at:

http://www.wrh.noaa.gov/lox/ then click on "Los Angeles" on the area map

From the forecast page, the link to "Quantitative Precipitation Forecast" provides forecasted precipitation in inches for the next 24 hours, in 3-hour increments for the first 12 hours and in 6-hour increments for the last 12 hours.

C-2.1.5 Flow Gage Measurements

USGS flow gages along the San Gabriel River will be used to determine whether the receiving water flow has exceeded the 20 percent threshold. Flows above the 20 percent threshold will classify the receiving water body as being in "wet" conditions and flows that are less than the 20 percent threshold will be "dry" conditions. In addition to the USGS rain gages, field crews will monitor flow at each of the sampling sties. **Table C-15** presents the location of flow gages located on the San Gabriel River.

Table C-15.
LA River and Tributary Flow Gages

Waterbody	Water Body Type	Gage Location	Gage ID
San Gabriel River	Main Stem	San Gabriel River above Whittier Narrows Dam	SGRW

San Gabriel River	Main Stem	San Gabriel River Below Santa Fe Dam	SGRS

C-2.2 Sample Handling

Proper sampling handling ensures the samples will comply with the monitoring methods and analytical hold time and provides traceable documentation throughout the history of the sample.

C-2.2.1 Documentation Procedures

The USGR EWMP Group is responsible for ensuring that each field sampling team adheres to proper custody and documentation procedures. Field log sheets documenting sample collection and other monitoring activities for each site will be bound in a separate master logbook for each event. Field personnel have the following responsibilities:

1. Keep an accurate written record of sample collection activities on the field log sheets.
2. Ensure that all field log sheet entries are legible and contain accurate and inclusive documentation of all field activities.
3. Note errors or changes using a single line to cross out the entry and date and initial the change.
4. Ensure that a label is affixed to each sample collected and that the labels uniquely identify samples with a sample ID, site ID, date and time of sample collection and the sampling crew initials.
5. Complete the chain of custody forms accurately and legibly.

C-2.2.2 Field Documentation/ Field Log

Field crews will keep a field log book for each sampling event that contains a calibration log sheet, a field log sheet for each site, and appropriate contact information. The following items should be recorded on the field log sheet for each sampling event:

- Monitoring station location (Station ID);
- Date and time(s) of sample collection;
- Name(s) of sampling personnel;
- Sample collection depth;
- Sample ID numbers and unique IDs for any replicate or blank samples;
- QC sample type (if appropriate);
- Requested analyses (specific parameters or method references);
- Sample type (e.g., grab or composite);
- The results of field measurements (e.g., flow, temperature, dissolved oxygen, pH, conductivity, turbidity) and the time that measurements were made;
- Qualitative descriptions of relevant water conditions (e.g., water color, flow level, clarity) or weather (e.g., wind, rain) at the time of sample collection;
- Trash observations (presence/absence);
- Observations of recreational activities;
- A description of any unusual occurrences associated with the sampling event, particularly those that may affect sample or data quality.

The field log will be scanned into a PDF within one week of the conclusion of each sampling event. Alternatively, all measurements could be collected on an electronic device such as laptop or tablet computer. **Appendix 1** contains an example of the field log sheet.

C-2.2.3 Sample Handling and Shipment

The field crews will have custody of samples during each monitoring event. Chain-of-custody (COC) forms will accompany all samples during shipment to contract laboratories to identify the shipment contents. All water quality samples will be transported to the analytical laboratory by the field crew or by courier. The original COC form will accompany the shipment, and a signed copy of the COC form will be sent, typically via fax, by the laboratory to the field crew to be retained in the project file.

While in the field, samples will be stored on ice in an insulated container. Samples that must be shipped to the laboratory must be examined to ensure that container lids are tight and placed on ice to maintain the appropriate temperature. The ice packed with samples must be approximately 2 inches deep at the top and bottom of the cooler, and must contact each sample to maintain temperature. The original COC form(s) will be double-bagged in re-sealable plastic bags and either taped to the outside of the cooler or to the inside lid. Samples must be shipped to the contract laboratory according to transportation standards. The method(s) of shipment, courier name, and other pertinent information should be entered in the “Received By” or “Remarks” section of the COC form.

Coolers must be sealed with packing tape before shipping, unless transported by field or lab personnel, and must not leak. It is assumed that samples in tape-sealed ice chests are secure whether being transported by common carrier or by commercial package delivery. The laboratory’s sample receiving department will examine the shipment of samples for correct documentation, proper preservation and compliance with holding times. The following procedures are used to prevent bottle breakage and cross-contamination:

- Bubble wrap or foam pouches are used to keep glass bottles from contacting one another to prevent breakage, re-sealable bags will be used if available.
- All samples are transported inside hard plastic coolers or other contamination-free shipping containers.
- If arrangements are not made in advance, the laboratory’s sample receiving personnel must be notified prior to sample shipment.

All samples remaining after successful completion of analyses will be disposed of properly. It is the responsibility of the personnel of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals. Samples will be stored and transported as noted in **Table C-9**. Samples not analyzed locally will be sent on the same day that the sample collection process is completed, if possible. Samples will be delivered to the appropriate laboratory as will be indicated in **Table C-16**. Note that due to procurement procedures, the analytical laboratories have not been identified at this time. Information for all laboratories will be added to this table following their selection and upon CIMP update. Appropriate contacts will be listed along with lab certification information in **Table C-16**.

Table C-16.
Information on Laboratories Conducting Analysis for the USGR CIMP

Laboratory[1]	General Category of Analysis	Shipping Method	Contact	Phone	Address	Lab Certification No. & Expiration Date[2]

1. Information for all laboratories will be added to this table following their selection and upon CIMP update.
2. Lab certifications are renewed on an annual basis.

C-2.2.4 Chain-of Custody Forms

Sample custody procedures provide a mechanism for documenting information related to sample collection and handling. Sample custody must be traceable from the time of sample collection until results are reported. A sample is considered under custody if:

- It is in actual possession.
- It is in view after in physical possession.
- It is placed in a secure area (accessible by or under the scrutiny of authorized personnel only after in possession).

A COC form must be completed after sample collection and prior to sample shipment or release. The COC form, sample labels, and field documentation will be cross-checked to verify sample identification, type of analyses, number of containers, sample volume, preservatives, and type of containers. A complete COC form is to accompany the transfer of samples to the analyzing laboratory. A typical COC form is presented in **Appendix 1**.

C-2.2.5 Laboratory Custody Procedures

Laboratories will follow sample custody procedures as outlined in the laboratory's QA Manual. A copy of each contract laboratory's QA Manual should be available at the laboratory upon request. Laboratories shall maintain custody logs sufficient to track each sample submitted and to analyze or preserve each sample within specified holding times. The following sample control activities must be conducted at the laboratory:

- Initial sample login and verification of samples received with the COC form;
- Document any discrepancies noted during login on the COC;
- Initiate internal laboratory custody procedures;
- Verify sample preservation (e.g., temperature);
- Notify the USGR EWMP Group if any problems or discrepancies are identified; and,
- Perform proper sample storage protocols, including daily refrigerator temperature monitoring and sample security.

Laboratories shall maintain records to document that the above procedures are followed. Once samples have been analyzed, samples will be stored at the laboratory for at least 30 days. After this period, samples may be disposed of properly.

C-2.3 Field Protocols

Briefly, the key aspects of quality control associated with field protocols for sample collection for eventual chemical and toxicological analyses are as follows:

1. Field personnel will be thoroughly trained in the proper use of sample collection gear and will be able to distinguish acceptable versus unacceptable water samples in accordance with pre-established criteria.
2. Field personnel will be thoroughly trained to recognize and avoid potential sources of sample contamination (e.g., engine exhaust, ice used for cooling).
3. Sampling gear and utensils which come in direct contact with the sample will be made of non-contaminating materials (e.g., borosilicate glass, high-quality stainless steel and/or Teflon™, according to protocol) and will be thoroughly cleaned between sampling stations according to appropriate cleaning protocol (rinsing thoroughly at minimum).
4. Sample containers will be of the recommended type and will be free of contaminants (i.e., pre-cleaned).
5. Conditions for sample collection, preservation, and holding times will be followed.

Field crews will be comprised of two persons per crew, minimum. For safety reasons, sampling will occur during daylight hours, when possible. Sampling on weekends and holidays will also be avoided. Other constraints on sampling events include, but are not limited to, lab closures and toxicity testing organism availability. Sampling events should proceed in the following manner:

1. Before leaving the sampling crew base of operations, confirm number and type of sample containers as well as the complete equipment list.
2. Proceed to the first sampling site.
3. Fill-out the general information on the field log sheet.
4. Collect the environmental and quality assurance/quality control (QA/QC) samples indicated on the event summary sheet and store samples appropriately. Using the field log sheet, confirm that all appropriate containers were filled.
5. Collect field measurements and observations, and record these on the field log sheet.
6. Repeat the procedures in steps 3, 4, and 5 for each of the remaining sampling sites.
7. Complete the COC forms using the information on the field log sheets.
8. After sample collection is completed, deliver and/or ship samples to appropriate laboratory.

C-2.4 Sample collection

All samples will be collected in a manner appropriate for the specific analytical methods to be used. The proper sampling techniques, outlined in this section, will ensure that the collected samples are representative of the waterbodies sampled. Should field crews feel that it is unsafe to collect samples for any reason, the field crews **SHOULD NOT COLLECT** a sample and note on the field log that the sample was not collected, why the sample was not collected, and provide photo documentation, if feasible.

C-2.4.1 Overview of Sampling Techniques

As described below, the method used to collect water samples is dependent on the depth, flow, and sampling location (receiving water, outfall). Nonetheless, in all cases:

1. Throughout each sample collection event, the sampler should exercise aseptic techniques to avoid any contamination (i.e., do not touch the inner surfaces or lip edges of the sample bottle or cap).
2. The sampler should use clean, powder-free, nitrile gloves for each site to prevent contamination.
3. When collecting the sample, the sampler should not breathe, sneeze, or cough in the direction of the container.
4. Gloves should be changed if they are soiled, or if the potential for cross-contamination exists from handling sampling materials or samples.
5. While the sample is collected, the bottle lid shall not be placed on the ground.
6. The sampler should not eat or drink during sample collection.
7. The sampler should not smoke during sample collection.
8. Each person on the field crew should wear clean clothing that is free of dirt, grease, or other substances that could contaminate the sampling apparatus or sample bottles.
9. Sampling should not occur near a running vehicle. Vehicles should not be parked within the immediate sample collection area, even non-running vehicles.
10. When the sample is collected, ample air space should be left in the bottle to facilitate mixing by shaking for lab analysis, unless otherwise required by the method.
11. After the sample is collected and the cap is tightly screwed back on the bottle, the time of sampling should be recorded on the field log sheet.
12. Any QA/QC samples that are collected should be also be noted on the field log sheet and labeled according the convention described in **Section C-1**
13. Samples should be stored as previously described.
14. COC forms should be filled out as described in **Section C-2.2.4** of this Attachment and delivered to the appropriate laboratory as soon as feasible to ensure hold times are met.

To prevent contamination of samples, clean metal sampling techniques using USEPA protocols outlined in USEPA Method 1669[1] will be used throughout all phases of the water sample collection. The protocol for clean metal sampling, based on USEPA Method 1669, is summarized below:

1. Samples are collected in rigorously pre-cleaned sample bottles with any tubing specially processed to clean sampling standards.
2. At least two persons, wearing clean, powder-free nitrile or latex gloves at all times, are required on a sampling crew.
3. One person, referred to as "dirty hands", opens only the outer bag of all double-bagged sample bottles.
4. The other person, referred to as "clean hands", reaches into the outer bag, opens the inner bag and removes the clean sample bottle.
5. Clean hands rinses the bottle at least two times by submerging the bottle, removing the bottle lid, filling the bottle approximately one-third full, replacing the bottle lid, gently shaking and then emptying the bottle. Clean hands then collects the sample by submerging the bottle, removing the lid, filling the bottle and replacing the bottle cap

1 USEPA. April 1995. *Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels.* EPA 821-R-95-034.

while the bottle is still submerged.

6. After the sample is collected, the sample bottle is double-bagged in the opposite order from which it was removed from the same double-bagging.
7. Clean, powder-free gloves are changed whenever something not known to be clean has been touched.

C-2.4.2 Field Measurements and Observations

Field measurements will be collected and observations made at each sampling site after a sample is collected. Field measurements will include the parameters identified in the CIMP for which a laboratory analysis is not being conducted. Field monitoring equipment must meet the requirements outlined in **Table C-5**. Field measurements for sediment samples shall be collected from within one meter of the sediment. All field measurement results and field observations will be recorded on a field log sheet similar to the one presented in **Appendix 1** and as described in **Section C-2.2.4** of this Attachment.

Measurements (except for flow) will be collected at approximately mid-stream, mid-depth at the location of greatest flow (if feasible) with a Hydrolab DS4 multi-probe meter, or comparable instrument(s). If at any time the collection of field measurements by wading appears to be unsafe, field crews will not attempt to collect mid-stream, mid-depth measurements. Rather, field measurements will be made either directly from a stable, unobstructed area at the channel edge, or by using a telescoping pole and intermediate container to obtain a sample for field measurements and for filling sample containers. For situations where flows are not sufficiently deep to submerge the probes, an intermediate container will be utilized. The location of field measurements will be documented on the field log sheet.

Flow measurements will be collected as outlined in the following subsections at freshwater receiving water and non-stormwater outfall monitoring sites. Regardless of measurement technique used, if a staff gage is present the gage height will be noted. Field crews may not be able to measure flow at several sites during wet weather because of inaccessibility of the site. If this is the case, site inaccessibility will be documented on the field log sheet.

The field sampling crew has the primary responsibility for responding to failures in the sampling or measurement systems. Deviations from established monitoring protocols will be documented in the comment section of the field log sheet and noted in the post event summaries. If monitoring equipment fails, monitoring personnel will report the problem in the notes section of the field log sheet and will not record data values for the variables in question. Broken equipment will be replaced or repaired prior to the next field use. Data collected using faulty equipment will not be used.

C-2.4.2.1 Shallow Sheet Flow Measurements

If the depth of flow does not allow for the measurement of flow with a velocity meter (<0.1-foot) a “float” will be used to measure the velocity of the flowing water. The width, depth, velocity, cross section, and corresponding flow rate will be estimated as follows:

- **Sheet flow width:** The width (W) of the flowing water (not the entire part of the channel that is damp) is measured at the “top”, “middle”, and “bottom” of a marked-off distance – generally 10 feet (e.g., for a 10-foot marked-off section, W_{Top} is measured at 0-feet, W_{Mid}

is measured at 5 feet, and W_{Bottom} is measured at 10 feet).

- **Sheet flow depth:** The depth of the sheet flow is measured at the top, middle, and bottom of the marked-off distance. Specifically, the depth (D) of the sheet flow is measured at 25%, 50%, and 75% of the flowing width (e.g., $D_{50\%}^{Mid}$ is the depth of the water at middle of the section in the middle of the sheet flow) at each of the width measurement locations. It is assumed that the depth at the edge of the sheet flow (i.e., at 0% and 100% of the flowing width) is zero.

- **Representative cross-section:** Based on the collected depth and width measurements, the representative cross-sectional area across the marked-off sheet flow is approximated as follows:

$$\begin{aligned}
&\text{Re}\mathit{presentative\ Cross\ Section} = \\
&Average\ \{[\frac{W_{Top}}{4}\times(\frac{D_{25\%}^{Top}}{2}+\frac{\left(D_{50\%}^{Top}+D_{25\%}^{Top}\right)}{2}+\frac{\left(D_{75\%}^{Top}+D_{50\%}^{Top}\right)}{2}+\frac{D_{75\%}^{Top}}{2})], \\
&[\frac{W_{Mid}}{4}\times(\frac{D_{25\%}^{Mid}}{2}+\frac{\left(D_{50\%}^{Mid}+D_{25\%}^{Mid}\right)}{2}+\frac{\left(D_{75\%}^{Mid}+D_{50\%}^{Mid}\right)}{2}+\frac{D_{75\%}^{Mid}}{2})], \\
&[\frac{W_{Bottom}}{4}\times(\frac{D_{25\%}^{Bottom}}{2}+\frac{\left(D_{50\%}^{Bottom}+D_{25\%}^{Bottom}\right)}{2}+\frac{\left(D_{75\%}^{Bottom}+D_{50\%}^{Bottom}\right)}{2}+\frac{D_{75\%}^{Bottom}}{2})]\}
\end{aligned}$$

- **Sheet flow velocity:** Velocity is calculated based on the amount of time it took a float to travel the marked-off distance (typically 10-feet or more). Floats are normally pieces of leaves, litter, or floatables (suds, etc.). The time it takes the float to travel the marked-off distance is measured at least three times. Then average velocity is calculated as follows:

$$Average\ Surface\ Velocity = \frac{Distance\ Marked\ off\ for\ Float\ Measurement}{Average\ Time\ for\ Float\ to\ Travel\ Marked\ off\ Distance}$$

- **Flow Rate calculation:** For sheet flows, based on the above measurements/estimates, the estimated flow rate, Q, is calculated by:

$$Q = f\ x\ (Representative\ Cross\ Section)\ x\ (Average\ Surface\ Velocity)$$

The coefficient f is used to account for friction effects of the channel bottom. That is, the float travels on the water surface, which is the most rapidly-traveling portion of the water column. The average velocity, not the surface velocity, determines the flow rate, and thus f is used to “convert” surface velocity to average velocity. In general, the value of f typically ranges from 0.60 – 0.90 (USGS 1982). Based on flow rate measurements taken during the LA River Bacteria Source Identification Study (CREST 2008) a value of 0.75 will be used for f in the equation.

However, the soft-bottom channels may require adjustment of the factor f, due to different hydraulic friction.

C-2.4.2.2 Free-flowing Outfalls

Some storm drain outfalls are free-flowing, meaning the runoff falls from an elevated outfall into the channel, which allows for collection of the entire flowing stream of water into a container of known volume (e.g., graduated bucket or graduated Ziploc bag). The time it takes to fill the known volume is measured using a stopwatch, and recorded on the field log. The time it takes to fill the container will be measured three times and averaged to ensure that the calculated discharge is representative. In some cases, a small portion of the runoff may flow around or under the container. For each measurement, "percent capture", or the proportion of flow estimated to enter the bucket, will be recorded. For free-flowing outfalls, the estimated flow rate, Q, is calculated by:

$$Q = Average\left[\frac{Filled\ \ container\ Volume}{(Time\ to\ Fill\ \ Container)\times(Estimated\ \ Capture)}\right]$$

Based on measurements of free-flowing outfalls during the LA River Bacteria Source Identification Study (CREST, 2008), estimated capture typically ranges from 0.75 – 1.0.

C-2.4.3 Sampling Techniques for the Collection of Water

The following subsections provide details on the various techniques that can be utilized to collect water quality samples. Should field crews feel that it is unsafe to collect samples for any reason, the field crews **SHOULD NOT COLLECT** a sample and note on the field log that the sample was not collected, why the sample was not collected, and provide photo documentation, if feasible.

C-2.4.3.1 Direct Submersion: Hand Technique

Where practical, all grab samples will be collected by direct submersion at mid-stream, mid-depth using the following procedures:

1. Follow the standard sampling procedures described in **Section C-2.4.1** of this Attachment.
2. Remove the lid, submerge the container to mid-stream/mid-depth, let the container fill and secure the lid. In the case of mercury samples, remove the lid underwater to reduce the potential for contamination from the air.
3. Place the sample on ice.
4. Collect the remaining samples including quality control samples, if required, using the same protocols described above.
5. Follow the sample handling procedures described in **Section C-2.2** of this Attachment.

C-2.4.3.2 Intermediate Container Technique

Samples may be collected with the use of a clean intermediate container, if necessary, following the steps listed below. An intermediate container may include a container that is similar in composition to the sample container, a pre-cleaned pitcher made of the same material as the sample container, or a Ziploc bag. An intermediate container should not be reused at a different site without appropriate cleaning.

1. Follow the standard sampling procedures described in **Section C-2.4.1** of this Attachment.
2. Submerge the intermediate container to mid-stream/mid-depth (if possible), let the container fill, and quickly transfer the sample into the individual sample container(s) and secure the lid(s).
3. Place the sample(s) on ice.
4. Collect remaining samples including quality control samples, if required, using the same protocols described above.
5. Follow the sample handling procedures described in **Section C-2.2** of this Attachment.

Some flows may be too shallow to fill a container without using an intermediate container. When collecting samples from shallow sheet flows it is very important to not scoop up algae, sediment, or other particulate matter on the bottom because such debris is not representative of flowing water. To prevent scooping up such debris either: (1) find a spot where the bottom is relatively clean and allow the sterile intermediate container to fill without scooping; or (2) lay a clean sterile Ziploc® bag on the bottom and collect the water sample from on top of the bag. A fresh Ziploc® bag must be used at each site.

C-2.4.3.3 Pumping

Samples may be collected with the use of a peristaltic pump and specially cleaned tubing following the steps listed below. Sample tubing should not be reused at a different site without appropriate cleaning.

1. Follow the standard sampling procedures described in **Section C-2.4.1** of this Attachment.
2. Attach pre-cleaned tubing into the pump, exercising caution to avoid allowing tubing ends to touch any surface known not to be clean. A separate length of clean tubing must be used at each sample location for which the pump is used.
3. Place one end of the tubing below the surface of the water. To the extent possible, avoid placing the tubing near the bottom so that settled solids are not pumped into the sample container.
4. Hold the other end of the tubing over the opening of the sample container, exercising care not to touch the tubing to the sample container.
5. Pump the necessary sample volume into the sample container and secure the lid.
6. Place the sample on ice.
7. Collect remaining samples including quality control samples, if required, using the same protocols described above.
8. Follow the sample handling procedures described in **Section C-2.2** of this Attachment.

C-2.4.3.4 Autosamplers

Autosamplers are used to characterize the entire flow of a storm in one analysis. They can be programmed to take aliquots at either time- or flow-based specified intervals. Before beginning setup in the field, it is recommended to read the manufacturer’s instructions. The general steps to set up the autosampler are described below:

1. Connect power source to autosampler computer. This can be in the form of a battery or a power cable.
2. Install pre-cleaned tubing into the pump. Clean tubing will be used at each site and for each event, in order to minimize contamination.
3. Attach strainer to intake end of the tubing and install in sampling channel.
4. If running flow based composite samples; install flow sensor in sampling channel and connect it to the automatic compositor.
5. Label and install composite bottle(s). If sampler is not refrigerated, then add enough ice to the composite bottle chamber to keep sample cold for the duration of sampling or until such time as ice can be refreshed. Make sure not to contaminate the inside of the composite bottle with any of the ice.
6. Program the autosampler as per the manufacturer's instructions and make sure the autosampler is powered and running before leaving the site.

After the sample collection is completed the following steps must be taken to ensure proper sample handling:

1. Upon returning to the site, check the status of the autosampler and record any errors or missed samples. Note on the field log the time of the last sample, as this will be used for filling out the COCs.
2. Remove the composite bottle and store on ice. If dissolved metals are required, then begin the sample filtration process outlined in the following subsection, within 15 minutes of the last composite sample, unless compositing must occur at another location, in which case the filtration process should occur as soon as possible upon sample compositing.
3. Power down autosampler and leave sampling site.
4. The composite sample will need to be split into the separate analysis bottles either before being shipped to the laboratory or at the laboratory. This is best done in a clean and weatherproof environment, using clean sampling technique.

C-2.4.3.5 Dissolved Metals Field Filtration

When feasible, samples for dissolved metals will be filtered in the field. The following describes an appropriate dissolved field filtration method. An alternative an equivalent method may be utilized, if necessary. A 50mL plastic syringe with a 0.45µm filter attached will be used to collect and filter the dissolved metals sample in the field. The apparatus will either come certified pre-cleaned from the manufacturer and confirmed by the analytical laboratory or be pre-cleaned by and confirmed by the analytical laboratory at least once per year. The apparatus will be double bagged in Ziploc plastic bags.

To collect the sample for dissolved metals, first collect the total metals sample using clean sampling techniques. The dissolved sample will be taken from this container. Immediately prior to collecting the dissolved sample, shake the total metals sample. To collect the dissolved metals sample using clean sampling techniques, remove the syringe from the bag and place the tip of the syringe into the bottle containing the total metals sample and draw up 50 mL of sample into the syringe. Next, remove the filter from the zip-lock bag and screw it tightly into the tip of the syringe. Then put the tip of the syringe with the filter into the clean dissolved metals container and push the sample through the filter taking care not to touch the inside surface of the sample container with the apparatus. The sample volume needs to be a minimum of 20 mL. If the filter becomes clogged prior to generating 20 mL of sample, remove and dispose of the used filter and replace it with a new clean filter (using the clean sampling techniques). Continue to filter the sample. When 20 mL has been collected, cap the sample bottle tightly and store on ice for delivery to the laboratory.

C-2.4.4 Receiving Water Sample Collection

A grab sample is a discrete individual sample. A composite sample is a mixture of samples collected over a period of time either as time or flow weighted. A time-weighted composite is created by mixing multiple aliquots collected at specified time intervals. A flow-weighted composite is created by mixing multiple aliquots collected at equal time intervals but where the volume of the aliquot is based on flow rate. Generally, grab samples will be collected during dry weather and composite samples will be collected during wet weather. Should field crews feel that it is unsafe to collect samples for any reason, the field crews **SHOULD NOT COLLECT** a sample and note on the field log that the sample was not collected, why the sample was not collected, and provide photo documentation, if feasible.

Grab samples will be used for dry weather sampling events, because the composition of the receiving water will change less over time; and thus, the grab sample can sufficiently characterize the receiving water. Grab samples will be collected as described in **Section C-2.4.1** of this Attachment. Monitoring site configuration and consideration of safety will dictate grab sample collection technique. The potential exists for monitoring sites to lack discernable flow. Except in the case of lakes, the lack of discernable flow may generate unrepresentative data. To address the potential confounding interference that can occur under such conditions, sites sampled should be assessed for the following conditions and sampled or not sampled accordingly:

- Pools of water with no flow or no visible connection to another surface water body should not be sampled. The field log should be completed for non-water quality data (including date and time of visit) and the site condition should be photo-documented.
- Flowing water (i.e., based on visual observations, flow measurements, and a photo-documented assessment of conditions immediately upstream and downstream of the sampling site) site should be sampled.

Wet weather samples will generally be collected as either time- or flow-weighted composites. Grab samples may be utilized to collect wet weather sampling in certain situations, which may include, but are not limited to, situations where it is unsafe to collect composite samples or to perform investigative monitoring where composite sampling or installation of an autosampler may not be warranted.

It is the combined responsibility of all members of the sampling crew to determine if the performance requirements of the specific sampling method have been met, and to collect additional samples if required. If the performance requirements outlined above or documented in sampling protocols are not met, the sample will be re-collected. If contamination of the sample container is suspected, a fresh sample container will be used. The USGR EWMP Group will be contacted if at any time the sampling crew has questions about procedures or issues based on site-specific conditions.

C-2.4.5 Stormwater Outfall Sample Collection

Stormwater outfalls will be monitored with similar methods as discussed in **Section C-2.4.4** of this Attachment. Sampling will not be undertaken if the outfalls are not flowing or if conditions exist where the receiving water is back-flowing into the outfall. It is the combined responsibility of all members of the sampling crew to determine if the performance requirements of the specific sampling method have been met, and to collect additional samples if required. If the performance requirements outlined above or documented in sampling protocols are not met, the sample will be re-collected. If contamination of the sample container is suspected, a fresh sample container will be used. The USGR EWMP Group will be contacted if at any time the sampling crew has questions about procedures or issues based on site-specific conditions.

C-2.4.6 Non-Stormwater Outfall Screening Surveys and Sample Collection

The outfall screening process is designed to identify outfalls that have significant non-stormwater (NSW) discharges. The collection of water quality data will support the determination of significant NSW discharges as well as to characterize dry weather loading.

C-2.4.6.1 Preparation for Outfall Surveys

Preparation for outfall surveys includes preparation of field equipment, placing bottle orders, and contacting the necessary personnel regarding site access and schedule. The following steps should be completed two weeks prior to each outfall survey:

1. Check weather reports and LACDPW rain gage to ensure that antecedent dry weather conditions are suitable.
2. Contact appropriate Flood Maintenance Division personnel from LACDPW to notify them of dates and times of any activities in flood control channels.
3. Contact laboratories to order bottles and to coordinate sample pick-ups.
4. Confirm scheduled sampling date with field crews.
5. Set-up sampling day itinerary including sample drop-offs and pick-ups.
6. Compile field equipment.
7. Prepare sample labels.
8. Prepare event summaries to indicate the type of field measurements, field observations, and samples to be taken at each of the outfalls.
9. Prepare COCs.
10. Charge the batteries of field tablets (if used).

C-2.4.6.2 Non-Stormwater Sample Collection

Water quality samples will be collected consistent with the dry weather requirements outlined in the receiving water monitoring section using the direct submersion, intermediate container, shallow sheet flow, or pumping methods described in **Section C-2.4.3** of this Attachment.

C-2.4.7 Stormborne Sediment Sampling

The Puddingstone Reservoir TMDLs and the Harbors Toxics TMDLs include requirements for the analysis of water quality samples to assess the contribution of certain organic pollutants associated with bulk sediment (**Table C-17**). The East San Gabriel Valley WMP Group will collect and analyze the stormwater outfall samples to Puddingstone Reservoir. The Lower San Gabriel River WMP Group will collect and analyze the samples for San Gabriel River and

Coyote Creek near the confluence with the San Gabriel River Estuary. Both groups will share the analytical results with the USGR EWMP Group.

Table C-17.
Categories of Constituents for Assessing Sediment Concentrations in Water for the Puddingstone Reservoir and the Harbors Toxics TMDLs

General Category of Constituent	Harbors Toxics TMDLs	Puddingstone Reservoir TMDLs
Metals(1)	X	
DDTs(2)	X	X
Chlordanes(2)		X
Dieldrin		X
PCBs(2)	X	X
PAHs(2)	X	

1. Metals include copper, lead, silver, and zinc.
2. See **Table C-3** for a list of individual constituents in each category.

Most of the organochlorine (OC) pesticides and PCBs and many of the PAHs tend to strongly associate with sediment and organic material. These constituents commonly have octanol/water partition coefficients (log Kow) that are greater than six, elevated soil/water partition coefficients (log Kd) and elevated soil adsorption coefficients (log Koc). The lighter weight PAHs such as naphthalene, acenaphthene and acenaphthylene tend to be more soluble in water and volatile. Concentrations of OC pesticides, PCBs, and PAHs are often below or are very close to the limits of detection for conventional analytical methods used for analyzing water samples. Although collection and filtration of high volumes of stormwater will allow improved quantification of these constituents, it also introduces substantial potential for introduction of errors.

Use of filtration methods in combination with conventional analytical methods requires collection of extremely large volumes of stormwater and challenging filtration processes. Use of conventional analytical methods for analysis of the filtered sediment is then expected to require at least 5 grams of sediment (typically 10 grams is preferred by laboratories) for each of the groups of analytes (metals, OC pesticides, PCBs and PAHs) in order to achieve detection limits necessary to quantify loads. In addition, the direct impacts of filtering samples with high sediment content are not well understood. Efforts by the City of Los Angeles and Los Angeles County in the Ballona Creek and Marina del Rey watersheds, respectively, have demonstrated the challenges associated with collecting and analyzing suspended sediments. Assuming samples contain sediment at an average TSS concentration of 100 mg/L and that all sediment could be recovered, analyses might require as much as 50 liters for each test method (total of 200 liters). An ongoing special study is underway in Marina del Rey to evaluate various methods for capturing sufficient sediment to conduct analysis. In Ballona Creek, the City of Los Angeles has been successful in collecting sufficient volumes of sediment over the course of a year to conduct the analysis. This allows for the quantification of annual loading; however, it does not allow for an evaluation of concentrations and loads under various storm conditions. Although use of lower sediment volumes may be possible, both detection limits and quality control measures might be impacted. In Ballona Creek, duplicate and quality control analysis have been limited to the available sediment, resulting in situations where either certain target constituents or quality control analysis are not completed.

An alternative approach for assessing the loads of the constituents of interest will be utilized in this CIMP to substantially reduce the amount of sample needing to be handled and potential for introduction of error. This approach will utilize High Resolution Mass Spectrometry (HRMS) to analyze for OC pesticides (USEPA 1699), PCBs (USEPA 1668) and PAHs (CARB). HRMS analyses are quantified by isotope dilution techniques. Analytical performance is measured by analysis of Ongoing Precision and Recovery (OPR) analyses and labeled compound recovery. Conventional methods for analyzing for metals of interest are sufficiently sensitive to assess concentrations on suspended sediments. During the first three years, analyses will be conducted on whole water samples. These test methods provide detection limits that are roughly 100 times more sensitive than conventional analytical methods. In addition, these extremely low detection limits can be achieved with as little as 3-6 liters of stormwater at a TSS of approximately 50 mg/L.

As with any low detection level method, clean sample techniques are of paramount importance. Field blanks are essential to ensure the sample collection mechanism do not introduce contamination.

Use of this approach is expected to greatly enhance the ability to consistently obtain appropriate samples for measuring and comparing loads of constituents of interest associated with each sampling event. This will assure that all key toxics can be quantified at levels suitable for estimation of mass loads.

For purposes of load calculations, it would be assumed that 100% of OC pesticides, PCBs and PAHs were associated with suspended solids. Separate analyses of TSS would be used to normalize the data. After three years (approximately four to six storm events) the data will be reevaluated to assess whether continued use of the HRMS approach remains to be beneficial. If deemed necessary, a modified approach will be evaluated for analysis of filtered suspended sediments.

C-2.4.7.1 Sampling and Analytical Procedures

Stormwater samples for outfalls to Puddingstone Reservoir PCBs and OC Pesticide TMDLs and the Harbors Toxics TMDLs will be collected by the East San Gabriel Valley WMP Group and the Lowe San Gabriel River EWMP Group using autosamplers as described in **Section C-2.4.3.4**. Both groups will share the analytical results with the USGR EWMP Group. Based on TSS measurements at three mass emission sites in LA County (**Table C-18**), use of a TSS concentration of 100 mg/L is expected to provide a conservative basis for estimating reporting limits for OC pesticides, PCBs, and PAHs in suspended sediments based upon 1-liter samples. However, two liters of storm water will be provided for each organic analytical suite for a total of six liters. An accurate measure of suspended sediments is critical to this sampling approach. TSS will be analyzed; however, SSC will be used as the standard for calculating the concentrations of target constituents in suspended sediments and total loads.

Since detection limits will depend upon the concentration of suspended sediment in the sample, the laboratory analyzing the suspended sediment concentrations will be asked to provide a rush analysis to provide information that can be used to direct processing of the samples for the organic compounds. If TSS/SSC are less than 150 mg/L, two liters will be extracted for subsequent HRMS analysis. If TSS concentrations are between 150 and 200 mg/L, one of the additional liter samples may be used to increase the volume of sample water for just PAHs or the additional liter may be used as a field duplicate for each analysis. If TSS concentrations are greater than 200 mg/L, the additional liter may be used as a field duplicate for each analysis. If the initial TSS sample indicates that sediment content is less than 50 mg/L, additional measures will be taken to improve PAH reporting limits with respect to suspended sediment loads. A field duplicate from one site will be analyzed if adequate sample volumes are obtained.

Target reporting limits (**Table C-19** and **Table C-20**) were established based upon bed sediment reporting limits listed in the *Coordinated Compliance and Reporting Plan for the Greater Los Angeles and Long Beach Harbor Waters* (Anchor QEA, 2013). **Table C-19** and **Table C-20** provide a summary of the detection limits attainable in water samples using HRMS analytical methods. Estimated detection limits are provided for concentrations of the target constituents in suspended sediments given the assumption that suspended sediment content of the water sample is 100 mg/L and that 100 percent of the target constituents are associated with the suspended sediment. This provides a conservative assumption with respect to evaluating the potential impacts of concentrations of OC pesticides, PCBs, and PAHs in suspended sediment on concentrations in bed sediment. Additionally, **Table C-19** and **Table C-20** present relevant TMDL targets and reporting limits suggested in the SWAMP QAPP (SWRCB, 2008) and the SQO Technical Support Manual (SCCWRP, 2009). The following summarizes a comparison between the estimated detection limits for OC pesticides, PCBs, and PAHs in the suspended sediments to target reporting limits:

- For OC pesticides (**Table C-19**), estimated detection limits in the suspended sediment are at or below TMDL targets limits for bed sediments, except for dieldrin. The dieldrin estimated detection limit is above the lowest TMDL target, but not the remaining TMDL targets, and is below observed concentrations reported in the TMDL staff reports. Additionally, estimated detection limits in the suspended sediment are below target bed sediment reporting limits for this CIMP and target reporting limits presented in the SWAMP QAPP (SWRCB, 2008) and the SQO Technical Support Manual (SCCWRP, 2009), except for dieldrin. Dieldrin is above the bed sediment reporting limit in this CIMP, but below target reporting limits presented in the SWAMP QAPP (SWRCB, 2008) and the SQO Technical Support Manual (SCCWRP, 2009).
- For PCBs (**Table C-19**), estimated detection limits in the suspended sediment are below TMDL targets limits for bed sediments. Additionally, estimated detection limits in the suspended sediment are at or below target bed sediment reporting limits for this CIMP and below target reporting limits presented in the SWAMP QAPP (SWRCB, 2008) and the SQO Technical Support Manual (SCCWRP, 2009).
- For PAHs (**Table C-20**), estimated detection limits in the suspended sediment are below TMDL targets limits for bed sediments. Most individual PAH compounds would be expected to be detectable in the suspended sediment at concentrations about 2.5 times greater that the target bed sediment reporting limits for this CIMP and the target reporting limits presented in the SWAMP QAPP (SWRCB, 2008). Approximately half of the individual PAH compounds are above the target reporting limits presented in the SQO Technical Support Manual (SCCWRP, 2009), while the other half are below. Two compounds, naphthalene and phenanthrene, would have detection limits roughly 6 times the target bed sediment reporting limits for this CIMP. Naphthalene is an extremely light weight PAH that is not considered a major analyte of concern in storm water.

As noted previously, metals of interest are quantifiable with standard analytical methods. Detection limits for trace metals (**Table C-2**) are suitable for calculation of concentrations in suspended solids and the concentration of trace metals associated with the particulate fraction will be calculated as:

$C_P=C_T-C_D$

where C_T =Concentration of total recoverable metals

C_D =Concentration of dissolved fraction

C_P =Concentration of the particulate fraction

USEPA's guidance document for development of metals translators (EPA, 1996) uses the same approach for calculation of the trace metals in the particulate fraction.

In summary, all but one of the target reporting limits are below relevant TMDL targets and the overwhelming majority are below bed sediment reporting limits identified in this CIMP and the SWAMP QAPP (SWRCB, 2008) and SQO Technical Support Manual (SCCWRP, 2009). The approach to analyzing whole water samples to estimate concentrations of target pollutants on bed sediment provides an opportunity to improve the understanding of loads during multiple storms each year.

Table C-18.
Summary of Median TSS Measurements (mg/L)
at the San Gabriel River Mass Emission Site

Waterbody	LACFCD Monitoring Site ID	Median
San Gabriel River	S14	113
Coyote Creek	S13	265

Table C-19. Recommended Methods, Estimated Detection Limits, Target Reporting Limits, and Relevant TMDL Targets for Organochlorine Pesticides and Total PCBs

Constituent and Analytical Method	Water Detection Limit (1)	Suspended Sediment Detection Limit (2)	USGR CIMP Target Bed Sediment Reporting Limits	SWAMP QAPP (2008) Reporting Limit	SQO Technical Support Manual (2009) Reporting Limit	Harbors Toxics TMDL Sediment Target (Indirect Effects)	Harbors Toxics TMDL Sediment Target (Direct Effects)	Puddingstone Reservoir Sediment Target (Indirect Effects)
	pg/L	ng/g – dry wt						
Chlordane Compounds (EPA 1699)								
alpha-Chlordane	40	0.4	0.5	1	0.5	1.3 (Total Chlordane)	0.5 (Total Chlordane)	0.75 (Total Chlordane)
gamma-Chlordane	40	0.4	0.5	1	0.54			
Oxychlordane	40	0.4	0.5	1	NA			
trans-Nonachlor	40	0.4	0.5	1	4.6			
cis-Nonachlor	40	0.4	0.5	2	NA			
Other OC Pesticides (EPA 1699)								
2,4'-DDD	40	0.4	0.5	2	0.5	1.9 (Total DDT)	1.58 (Total DDT)	3.94 (Total DDT)
2,4'-DDE	80	0.4	0.5	2	0.5			
2,4'-DDT	80	0.4	0.5	3	0.5			
4,4'-DDD	40	0.4	0.5	2	0.5			
4,4'-DDE	80	0.4	0.5	2	0.5			
4,4'-DDT	80	0.4	0.5	5	0.5			
Total DDT	80	0.4	---	---	0.5			
Dieldrin	40	0.4	0.02	2	2.7	NA	0.02	0.22
Total PCBs (EPA 1668)	5-20	0.05-0.2	0.2	0.2	3.0	3.2	22.7	0.59

NA – Not applicable

1. Water MLs based upon 1 liter of water.
2. Suspended Sediment MLs based upon estimate of 100 mg/L suspended solids.
3. Target is for the summed value of the individual constituents and is not specific to each constituent species.

Table C-20. Estimated Detection Limits, Target Reporting Limits, and Relevant TMDL Targets for PAHs

Constituent	Water Detection Limit (1)	Suspended Sediment Detection Limit (2)	USGR CIMP Target Bed Sediment Reporting Limits	SWAMP QAPP (2009) Reporting Limit	SQO Technical Support Manual Reporting Limit	Harbors Toxics TMDL Sediment Target (Direct Effects)
	pg/L	ng/g – dry wt				
1-Methylnaphthalene	5	50	20	20	20	552 (Low Weight) (3) 1700 (High Weight) (3) 4700 (Total PAHs)
1-Methylphenanthrene	5	50	20	20	20	
2-Methylnaphthalene	5	50	20	20	20	
2,6-Dimethylnaphthalene	5	50	20	20	20	
Acenaphthene	5	50	20	20	20	
Anthracene	5	50	20	20	20	
Benzo(a)anthracene	5	50	20	20	80	
Benzo(a)pyrene	5	50	20	20	80	
Benzo(e)pyrene	5	50	20	20	80	
Biphenyl	5	50	20	20	20	
Chrysene	5	50	20	20	80	
Dibenz(a,h)anthracene	5	50	20	20	80	
Fluoranthene	5	50	20	20	80	
Fluorene	5	50	20	20	20	
Naphthalene	12.5	125	20	20	20	
Perylene	5	50	20	20	80	
Phenanthrene	12.5	125	20	20	20	
Pyrene	5	50	20	20	80	

NA – Not applicable

1. Water MLs based upon 1 liter of water and CARB 429m. Detection limits are based upon a final extract of 500 µL. If the SSC is low, either an additional liter of water can be extracted to halve the detection limit or the final extract volume can be reduced. Depending on sample characteristics, the extract volume can be reduced to as little as 50-100 µL which would drop MLs by a factor of 0.1 to 0.2 times the listed ML.
2. Suspended Sediment MLs based upon estimate of 100 mg/L suspended solids.

3. *Low Molecular Weight PAHs* Low weight PAHs include Acenaphthene, Anthracene, Phenanthrene, Biphenyl, Naphthalene, 2,6-dimethylnaphthalene, Fluorene, 1-methylnaphthalene, 2-methylnaphthalene, 1-methylphenanthrene, *High Molecular Weight PAHs:* Benzo(a)anthracene, Benzo(a)pyrene, Benzo(e)pyrene, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Perylene, Pyrene.

C-2.4.8 Sediment Sample Collection in Lakes

The top layer of sediment will be sampled from the bottom of the lake using an Eckman dredge or a similar device. While on a boat, the field crew will drop the Eckman dredge to the bottom of the lake and obtain a sample. Using a pre-cleaned stainless steel trowel, the field crew will scoop the top two to three centimeters of the sample and place it in a clean polyethylene bag. This procedure will be repeated, carefully to as not sample the exact same location, and the final composited sample will be mixed and placed into the appropriate sample jars.

C-2.4.9 Bioaccumulation Sample Collection

Bioaccumulation sampling will be used to monitor trends in the concentration of contaminants in the tissues of aquatic organisms. This will be conducted in order to assess both ecological and human health concerns and to see if the trends or patterns of contaminant concentrations mirror those observed from the sediment analyses. Human health concerns will be assessed by sampling the tissues from fish species that are commonly taken for consumption by sport fisherman.

Fish sampling protocols shall be conducted in accordance with the California Office of Environmental Health Hazard Assessment's (OEHHA) General Protocol for Sport Fish Sampling and Analysis. Fish may be analyzed, as individuals (preferred) or as composites (secondary). During each survey, the goal will be to collect at least nine fish per targeted species that are of legal size and/or edible size.[2] If fish are analyzed as composite samples, each composite sample shall include a minimum of three fish, with up to five fish per sample preferred, especially if smaller fish are caught (OEHHA, 2005). All fish composite samples must follow OEHHA's "75 percent rule," where the length of the smallest fish should be at least 75% of the length of the largest fish of a species in a composite sample.

Fish sampling techniques may vary due to season, weather, flow rate, target species, etc. Sport fish may be taken by hook and line or seine. Sampling gear may include electrofishing boats, backpack electrofishers, seine nets, gill nets, trap nets, hook and line, or other equipment as required. Reasonable attempts will be made to collect two to three species of sport fish; but, if sport fish cannot be obtained, whatever species of fish, if any, that can be obtained will be collected and analyzed. However, data collected from species that are not typically consumed will be for informational purposes only and not considered representative of human health exposures. The more likely a species is to be consumed by anglers, the greater the importance of information.

C-3 QUALITY CONTROL SAMPLE COLLECTION

Quality control samples will be collected in conjunction with environmental samples to verify data quality. Quality control samples collected in the field will generally be collected in the same manner as environmental samples. Detailed descriptions of quality control samples are presented in Section C-3.1 of this Attachment.

[2] The Department of Fish and Wildlife (DFW) Sport Fishing Regulations define legal size requirements using total length. All size measurements are in terms of total length.

C-3.1 Quality Assurance/Quality Control

This section describes the quality assurance and quality control requirements and processes. Quality control samples will be collected in conjunction with environmental samples to verify data quality. Quality control samples collected in the field will generally be collected in the same manner as environmental samples. There are no requirements for quality control for field analysis of general parameters (e.g., temperature, pH, conductivity, dissolved oxygen, and pH) outlined in SWAMP guidance documents. However, field crews will be required to calibrate equipment as outlined in **Section C-2** of this Attachment. **Table C-21** presents the quality assurance parameter addressed by each quality assurance requirement as well as the appropriate corrective action if the acceptance limit is exceeded.

Table C-21. Quality Control Requirements

Quality Control Sample Type	QA Parameter	Frequency(1)	Acceptance Limits	Corrective Action
Quality Control Requirements – Field				
Equipment Blanks	Contamination	5% of all samples(2)	< MDL	Identify equipment contamination source. Qualify data as needed.
Field Blank	Contamination	5% of all samples	< MDL	Examine field log. Identify contamination source. Qualify data as needed.
Field Duplicate	Precision	5% of all samples	RPD < 25% if |Difference| > RL	Reanalyze both samples if possible. Identify variability source. Qualify data as needed.
Quality Control Requirements – Laboratory				
Method Blank	Contamination	1 per analytical batch	< MDL	Identify contamination source. Reanalyze method blank and all samples in batch. Qualify data as needed.
Lab Duplicate	Precision	1 per analytical batch	RPD < 25% if |Difference| > RL	Recalibrate and reanalyze.
Matrix Spike	Accuracy	1 per analytical batch	80-120% Recovery for GWQC 75-125% for Metals 50-150% Recovery for Pesticides (3)	Check LCS/CRM recovery. Attempt to correct matrix problem and reanalyze samples. Qualify data as needed.
Matrix Spike Duplicate	Precision	1 per analytical batch	RPD < 30% if |Difference| > RL	Check lab duplicate RPD. Attempt to correct matrix problem and reanalyze samples. Qualify data as needed.
Laboratory Control Sample (or CRM or Blank Spike)	Accuracy	1 per analytical batch	80-120% Recovery for GWQC 75-125% for Metals 50-150% Recovery for Pesticides (3)	Recalibrate and reanalyze LCS/ CRM and samples.
Blank Spike Duplicate	Precision	1 per analytical batch	RPD < 25% if |Difference| > RL	Check lab duplicate RPD. Attempt to correct matrix problem and reanalyze samples. Qualify data as needed.
Surrogate Spike (Organics Only)	Accuracy	Each environmental and lab QC sample	30-150% Recovery3	Check surrogate recovery in LCS. Attempt to correct matrix problem and reanalyze sample. Qualify data as needed.

MDL = Method Detection Limit RL = Reporting Limit RPD = Relative Percent Difference
LCS = Laboratory Control Sample/Standard CRM = Certified/ Standard Reference Material
GWQC = General Water Quality Constituents

1. "Analytical batch" refers to a number of samples (not to exceed 20 environmental samples plus the associated quality control samples) that are similar in matrix type and processed/prepared together under the same conditions and same reagents (equivalent to preparation batch).
2. Equipment blanks will be collected by the field crew before using the equipment to collect sample.
3. Or control limits set at + 3 standard deviations based on actual laboratory data.

C-3.2 QA/QC Requirements and Objectives

C-3.2.1 Comparability

Comparability of the data can be defined as the similarity of data generated by different monitoring programs. For this monitoring program, this objective will be ensured mainly through use of standardized procedures for field measurements, sample collection, sample preparation, laboratory analysis, and site selection; adherence to quality assurance protocols and holding times; and reporting in standard units. Additionally, comparability of analytical data will be addressed through the use of standard operating procedures and extensive analyst training at the analyzing laboratory.

C-3.2.2 Representativeness

Representativeness can be defined as the degree to which the environmental data generated by the monitoring program accurately and precisely represent actual environmental conditions. For the CIMP, this objective will be addressed by the overall design of the program. Representativeness is attained through the selection of sampling locations, methods, and frequencies for each parameter of interest, and by maintaining the integrity of each sample after collection. Sampling locations were chosen that are representative of various areas within the watershed and discharges from the MS4, which will allow for the characterization of the watershed and impacts MS4 discharges may have on water quality.

C-3.2.3 Completeness

Data completeness is a measure of the amount of successfully collected and validated data relative to the amount of data planned to be collected for the project. It is usually expressed as a percentage value. A project objective for percent completeness is typically based on the percentage of the data needed for the program or study to reach valid conclusions.

Because the CIMP is intended to be a long term monitoring program, data that are not successfully collected during a specific sample event will not be recollected at a later date. Rather subsequent events conducted over the course of the monitoring will provide robust data sets to appropriately characterize conditions at individual sampling sites and the watershed in general. For this reason, most of the data planned for collection cannot be considered absolutely critical, and it is difficult to set a meaningful objective for data completeness.

However, some reasonable objectives for data are desirable, if only to measure the effectiveness of the program when conditions allow for the collection of samples (i.e., flow is present). The program goals for data completeness, shown in **Table C-5**, are based on the planned sampling frequency, SWAMP recommendations, and a subjective determination of the relative importance of the monitoring element within the CIMP. If, however, sampling sites do not allow for the collection of enough samples to provide representative data due to conditions (i.e., no flow) alternate sites will be considered. Data completeness will be evaluated on a yearly basis.

C-3.3 QA/QC Field Procedures

Quality control samples to be prepared in the field will consist of equipment blanks, field blanks, and field duplicates as described below.

C-3.3.1 Equipment Blanks

The purpose of analyzing equipment blanks is to demonstrate that sampling equipment is free from contamination. Equipment blanks will be collected by the analytical laboratory responsible for cleaning equipment and analyzed for relevant pollutants before sending the equipment to the field crew. Equipment blanks will consist of laboratory-prepared blank water (certified to be contaminant-free by the laboratory) processed through the sampling equipment that will be used to collect environmental samples.

The equipment blanks will be analyzed using the same analytical methods specified for environmental samples. If any analytes of interest are detected at levels greater than the MDL, the source(s) of contamination will be identified and eliminated (if possible), the affected batch of equipment will be re-cleaned, and new equipment blanks will be prepared and analyzed before the equipment is returned to the field crew for use.

C-3.3.2 Field Blanks

The purpose of analyzing field blanks is to demonstrate that sampling procedures do not result in contamination of the environmental samples. Per the Quality Assurance Management Plan for SWAMP (SWRCB, 2008) field blanks are to be collected as follows:

- At a frequency of 5% of samples collected for the following constituents: trace metals in water (including mercury), VOC samples in water and sediment, DOC samples in water, and bacteria samples.
- Field blanks for other media and analytes should be conducted upon initiation of sampling, and if field blank performance is acceptable (as described in Table C-21), further collection and analysis of field blanks for these other media and analytes need only be performed on an as-needed basis, or during field performance audits. An as-needed basis for the USGR CIMP will be annually.

Field blanks will consist of laboratory-prepared blank water (certified to be contaminant-free by the laboratory) processed through the sampling equipment using the same procedures used for environmental samples.

If any analytes of interest are detected at levels greater than the MDL, the source(s) of contamination should be identified and eliminated, if possible. The sampling crew should be notified so that the source of contamination can be identified (if possible) and corrective measures taken prior to the next sampling event.

C-3.3.3 Field Duplicates

The purpose of analyzing field duplicates is to demonstrate the precision of sampling and analytical processes. Field duplicates will be prepared at the rate of 5% of all samples, and analyzed along with the associated environmental samples. Field duplicates will consist of two grab samples collected simultaneously, to the extent practicable. If the Relative Percent Difference (RPD) of field duplicate results is greater than the percentage stated in **Table C-21** and the absolute difference is greater than the RL, both samples should be reanalyzed, if possible. The sampling crew should be notified so that the source of sampling variability can be identified (if possible) and corrective measures taken prior to the next sampling event.

C-3.4 QA/QC Laboratory Analyses

Quality control samples prepared in the laboratory will consist of method blanks, laboratory duplicates, matrix spikes/duplicates, laboratory control samples (standard reference materials), and toxicity quality controls.

C-3.4.1 Method Blanks

The purpose of analyzing method blanks is to demonstrate that sample preparation and analytical procedures do not result in sample contamination. Method blanks will be prepared and analyzed by the contract laboratory at a rate of at least one for each analytical batch. Method blanks will consist of laboratory-prepared blank water processed along with the batch of environmental samples. If the result for a single method blank is greater than the MDL, or if the average blank concentration plus two standard deviations of three or more blanks is greater than the RL, the source(s) of contamination should be corrected, and the associated samples should be reanalyzed.

C-3.4.2 Laboratory Duplicates

The purpose of analyzing laboratory duplicates is to demonstrate the precision of the sample preparation and analytical methods. Laboratory duplicates will be analyzed at the rate of one pair per sample batch. Laboratory duplicates will consist of duplicate laboratory fortified method blanks. If the RPD for any analyte is greater than the percentage stated in **Table C-21** and the absolute difference between duplicates is greater than the RL, the analytical process is not being performed adequately for that analyte. In this case, the sample batch should be prepared again, and laboratory duplicates should be reanalyzed.

C-3.4.3 Matrix Spikes and Matrix Spike Duplicates

The purpose of analyzing matrix spikes and matrix spike duplicates is to demonstrate the performance of the sample preparation and analytical methods in a particular sample matrix. Matrix spikes and matrix spike duplicates will be analyzed at the rate of one pair per sample batch. Each matrix spike and matrix spike duplicate will consist of an aliquot of laboratory-fortified environmental sample. Spike concentrations should be added at five to ten times the reporting limit for the analyte of interest.

If the matrix spike recovery of any analyte is outside the acceptable range, the results for that analyte have failed to meet acceptance criteria. If recovery of laboratory control samples is acceptable, the analytical process is being performed adequately for that analyte, and the problem is attributable to the sample matrix. An attempt will be made to correct the problem (e.g., by dilution, concentration, etc.), and the samples and matrix spikes will be re-analyzed.

If the matrix spike duplicate RPD for any analyte is outside the acceptable range, the results for that analyte have failed to meet acceptance criteria. If the RPD for laboratory duplicates is acceptable, the analytical process is being performed adequately for that analyte, and the problem is attributable to the sample matrix. An attempt will be made to correct the problem (e.g., by dilution, concentration, etc.), and the samples and matrix spikes will be re-analyzed.

C-3.4.4 Laboratory Control Samples

The purpose of analyzing laboratory control samples (or a standard reference material) is to demonstrate the accuracy of the sample preparation and analytical methods. Laboratory control samples will be analyzed at the rate of one per sample batch. Laboratory control samples will consist of laboratory fortified method blanks or a standard reference material. If recovery of any analyte is outside the acceptable range, the analytical process is not being performed adequately for that analyte. In this case, the sample batch should be prepared again, and the laboratory control sample should be reanalyzed.

C-3.4.5 Surrogate Spikes

Surrogate recovery results are used to evaluate the accuracy of analytical measurements for organics analyses on a sample-specific basis. A surrogate is a compound (or compounds) added by the laboratory to method blanks, samples, matrix spikes, and matrix spike duplicates prior to sample preparation, as specified in the analytical methodology. Surrogates are generally brominated, fluorinated or isotopically labeled compounds that are not usually present in environmental media. Results are expressed as percent recovery of the surrogate spike. Surrogate spikes are applicable for analysis of PCBs and pesticides.

C-3.4.6 Toxicity Quality Control

For aquatic toxicity tests, the acceptability of test results is determined primarily by performance-based criteria for test organisms, culture and test conditions, and the results of control bioassays. Control bioassays include monthly reference toxicant testing. Test acceptability requirements are documented in the method documents for each bioassay method.

C-4 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Frequencies and procedures for calibration of analytical equipment used by each contract laboratory are documented in the QA Manual for each laboratory. Any deficiencies in analytical equipment calibration should be managed in accordance with the QA Manual for each contract laboratory. Any deficiencies that affect analysis of samples submitted through this program must be reported to the USGR EWMP Group. Laboratory QA Manuals are available for review at the analyzing laboratory.

C-5 DATA MANAGEMENT

Section C-5 details the procedures for managing and reporting data meet the goals and objectives of the CIMP and in turn the Permit. The details contained herein serve as a guide for ensuring that consistent protocols and procedures are in place for successful data management and reporting.

C-5.1 Data Review, Verification, and Validation Requirements

The acceptability of data is determined through data verification and data validation. Both processes are discussed in detail below. In addition to the data quality objectives presented in **Table C-5**, the standard data validation procedures documented in the contract laboratory's QA Manual will be used to accept, reject, or qualify the data generated by the laboratory. Each laboratory's QA Officer will be responsible for validating data generated by the laboratory.

Once analytical results are received from the analyzing laboratory, the USGR EWMP Group will perform an independent review and validation of analytical results. **Appendix 2** provides equations that are used to calculate precision, accuracy, and completeness of the data. Decisions to reject or qualify data will be made by the USGR EWMP Group, based on the evaluation of field and laboratory quality control data, according to procedures outlined in Section 13 of Caltrans document No. CTSW-RT-00-005, *Guidance Manual: Stormwater Monitoring*

Protocols, 2nd Edition (LWA, 2000). Section 13 of the Caltrans Guidance Manual is included as **Appendix 2**.

C-5.1.1 Data Verification

Data verification involves verifying that required methods and procedures have been followed at all stages of the data collection process, including sample collection, sample receipt, sample preparation, sample analysis, and documentation review for completeness. Verified data have been checked for a variety of factors, including transcription errors, correct application of dilution factors, appropriate reporting of dry weight versus wet weight results, and correct application of conversion factors. Verification of data may also include laboratory qualifiers, if assigned.

Data verification should occur in the field and the laboratory at each level (i.e., all personnel should verify their own work) and as information is passed from one level to the next (i.e., supervisors should verify the information produced by their staff). Records commonly examined during the verification process include field and sample collection logs, COC forms, sample preparation logs, instrument logs, raw data, and calculation worksheets.

In addition, laboratory personnel will verify that the measurement process was "in control" (i.e., all specified data quality objectives were met or acceptable deviations explained) for each batch of samples before proceeding with the analysis of a subsequent batch. Each laboratory will also establish a system for detecting and reducing transcription and/or calculation errors prior to reporting data.

C-5.1.2 Data Validation

In general, data validation involves identifying project requirements, obtaining the documents and records produced during data verification, evaluating the quality of the data generated, and determining whether project requirements were met. The main focus of data validation is determining data quality in terms of accomplishment of measurement quality objectives (i.e., meeting QC acceptance criteria). Data quality indicators, such as precision, accuracy, sensitivity, representativeness, and completeness, are typically used as expressions of data quality. The USGR EWMP Group, will review verified sample results for the data set as a whole, including laboratory qualifiers, summarize data and QC deficiencies and evaluate the impact on overall data quality, assign data validation qualifiers as necessary, and prepare an analytical data validation report. The validation process applies to both field and laboratory data.

In addition to the data quality objectives presented in **Table C-5**, the standard data validation procedures documented in the analyzing laboratory’s QA Manual will be used to accept, reject, or qualify the data generated. The laboratory will only submit data that have met data quality objectives, or data that have acceptable deviations explained. When QC requirements have not been met, the samples will be reanalyzed when possible, and only the results of the reanalysis will be submitted, provided that they are acceptable. Each laboratory’s QA Officer is responsible for validating the data it generates.

C-5.1.3 Data Management

Analytical Data Reports will be sent to and kept by the USGR EWMP Group. Each type of report will be stored separately and ordered chronologically. The field crew shall retain the original field logs. The contract laboratory shall retain original COC forms. The contract laboratory will retain copies of the preliminary and final data reports. Concentrations of all parameters will be calculated as described in the laboratory SOPs or referenced method document for each analyte or parameter.

The field log and analytical data generated will be converted to a standard database format maintained on personal computers. After data entry or data transfer procedures are completed for each sample event, data will be validated. After the final quality assurance checks for errors are completed, the data will be added to the final database.

C-6 Reporting

The MRP includes a number of reporting requirements to summarize CIMP implementation efforts, the data collected as part of the CIMP, as well as to report on implementation of the Permit requirements as a whole. The following sections detail monitoring and reporting requirements outlined in the MRP and provides information on how the water, sediment, and tissue data collected as part of this CIMP data are to be used.

C-6.1 Semi-Annual Analytical Data Reports

As required by Part XIV.L of the MRP, results from each of the receiving water or outfall based monitoring stations conducted in accordance with the SOP shall be sent electronically to the Regional Board's Stormwater site at MS4stormwaterRB4@waterboards.ca.gov. The monitoring results will be submitted on a semi-annual basis and will highlight exceedances applicable to WQBELs, RWLs, action levels, or aquatic toxicity thresholds. Corresponding sample dates and monitoring locations will be included. Data will be transmitted in the most recent Southern California SMC's Standardized Data Transfer Formats. Reports of monitoring activities will include, at a minimum, the following information (records of which are required by Part XIV.A.1.c of the MRP):

1. The date, time of sampling or measurements, exact place, weather conditions, and rain fall amount.
2. The individual(s) who performed the sampling or measurements.
3. The date(s) analyses were performed.
4. The individual(s) who performed the analyses.
5. The analytical techniques or methods used.
6. The results of such analyses.
7. The data sheets showing toxicity test results.

C-6.2 Annual Monitoring Reports

As outlined in Part XVI.A of the MRP, the annual reporting process is intended to provide the Regional Board with summary information to allow for the assessment of the Permittee's:

1. Participation in one or more Watershed Management Programs.
2. Impact of each Permittee(s) stormwater and non-stormwater discharges on the receiving water.
3. Each permittee's compliance with RWLs, numeric WQBELs, and non-stormwater action levels.
4. The effectiveness of each Permittee(s) control measures in reducing discharges of pollutants from the MS4 to receiving waters.
5. Whether the quality of MS4 discharges and the health of receiving waters is improving, staying the

same, or declining as a result of watershed management program efforts, and/or TMDL implementation measures, or other MCMs.

6. Whether changes in water quality can be attributed to pollutant controls imposed on new development, re-development, or retrofit projects.

The annual report process also seeks to provide a forum for Permittee(s) to discuss the effectiveness of its past and ongoing control measure efforts and to convey its plans for future control measures. Detailed data and information will also be provided in a clear and transparent fashion to allow the Regional Board and the general public to review and verify conclusions presented by the Permittee. Annual reports shall be organized to include the information as described in the following subsections.

C-6.3 Watershed Summary Information

According to Section XVII.B of the MRP, Permittees shall include the information requested in MRP Section XVII.B parts A.1 through A.3 in its odd year Annual Report (e.g., Year 1, 3, 5). The requested information shall be provided for each watershed within the Permittee's jurisdiction. Alternatively, Permittees participating in a EWMP may provide the requested information through the development and submission of a EWMP plan and any updates. As the EWMP Group is submitting an EWMP the information is not required as a separate submittal. However, updates to information requested in Section XVII.B parts A.1 through A.3 (presented in **Sections C-6.3.1** through **C-6.3.3** below) will be noted in EWMP plan updates.

C-6.3.1 Watershed Management Area

When a Permittee has collaboratively developed an EWMP, reference to the EWMP and any revisions to the EWMP may suffice for baseline information regarding the following watershed management area details:

1. The effective TMDLs, applicable WQBELs and RWLs, and implementation and reporting requirements, and compliance dates.
2. CWA section 303(d) listings of impaired waters not addressed by TMDLs.
3. Results of regional bioassessment monitoring.
4. A description of known hydromodificaitons to receiving waters and a description, including locations, of natural drainage systems.
5. Description of groundwater recharge areas including number and acres.
6. Maps and/or aerial photographs identifying the location of Environmentally Sensitive Areas (ESAs), Areas of Special Biological Significance (ASBS), natural drainage systems, and groundwater recharge areas.

C-6.3.2 Subwatershed (HUC-12) Descriptions

When a Permittee has collaboratively developed an EWMP, reference to the EWMP and any revisions to the EWMP may suffice for information regarding the following Subwatershed (twelve digit Hydrologic Unit Code or HUC-12) descriptions:

1. Description including HUC-12 number, name and a list of all tributaries named in the Basin Plan.
2. Land use map of the HUC-12 watershed.

3. 85th percentile, 24-hour rainfall isohyetal map for the subwatershed.
4. One-year, one-hour storm intensity isohyetal map for the subwatershed.
5. MS4 map for the subwatershed, including major MS4 ourfalls and all low-flow diversions.

C-6.3.3 Description of Permittee(s) Drainage Area within the Subwatershed

When a Permittee has collaboratively developed an EWMP, reference to the EWMP and any revisions to the EWMP may suffice for information regarding the Drainage Area within the subwatershed:

1. A subwatershed map depicting the Permittee(s) jurisdictional area and the MS4, including major outfalls (with identification numbers), and low flow diversions located within the Permittee(s) jurisdictional area.
2. Provide the estimated baseline percent of effective impervious area (EIA) within the Permitte(s) jurisdictional area.

C-6.3.4 Annual Assessment and Reporting

The following sections will be included in the CIMP Annual Report to meet the MRP requirements. The Annual Report will clearly identify all data collected and strategies, control measures, and assessments implemented by each Permittee within the EWMP area, as well as those implemented by multiple Permittees on a watershed scale.

Stormwater Control Measures

All reasonable efforts will be made to determine, compile, analyze, and summarize the following information for each Permittee:

1. Estimated cumulative change in percent EIA since the effective date of the Order, and if possible, the estimated change in the stormwater runoff volume during the 85th percentile storm event.
2. Summary of New Development/Re-Development Projects constructed within the Permittee(s) jurisdictional area during the reporting year.
3. Summary of Retrofit Projects that reduced or disconnected impervious area from MS4 during the reporting year.
4. Summary of other projects designed to intercept stormwater runoff prior to discharge to the MS4 during the reporting year.
5. Estimate the total runoff volume retained on site by the implementation of such projects during the reporting year.
6. Summary of actions taken in compliance with TMDL implementation plans or approved EWMP to implement TMDL provisions.
7. Summary of riparian buffer/wetland restoration projects completed during the reporting year. For riparian buffers include width, length and vegetation type; for wetland include acres restored, enhanced, or created.
8. Summary of other MCMs implemented during the reporting year, as the Permittee deems relevant.
9. Status of all multi-year efforts that were not completed in the current year and will therefore continue into the subsequent year(s). Additionally, if any of the requested information cannot be obtained, the Permittee(s) will provide a discussion of the factor(s) limiting its acquisition and steps that will be taken to improve future data collection efforts.

Effectiveness Assessment of Stormwater Control Measures

The following information will be included to detail Stormwater Control Measures during the reporting year:

1. Rainfall summary for the reporting year, including the number of storm events, highest volume event (inches/24 hours), highest number of consecutive days with measurable rainfall, total rainfall during the reporting year compared to average annual rainfall for the EWMP area.
2. A summary table describing rainfall during stormwater outfall and wet-weather receiving water monitoring events. The summary description will include the date, time that the storm commenced and the storm duration in hours, the highest 15-minute recorded storm intensity (converted to inches/hour), the total storm volume (inches), and the time between the storm event sampled and the end of the previous storm event.
3. Where control measures were designed to reduce impervious cover or stormwater peak flow and flow duration, hydrographs or flow data of pre- and post-control activity for the 85th percentile, 24-hour rain event, if available.
4. For natural drainage systems, a reference watershed flow duration curve and comparison to a flow duration curve for the EWMP area under current conditions.
5. An assessment as to whether the quality of stormwater discharges as measured at designed outfalls is improving, staying the same, or declining. Water quality data may be compared from the reporting year to previous years with similar rainfall patterns, a trends analysis may be conducted, or other means may be used to develop and support the assessment's conclusions.
6. An assessment as to whether wet-weather receiving water quality is improving, staying the same or declining, when normalized for variations in rainfall patterns. Water quality data may be compared from the reporting year to previous years with similar rainfall patterns, a trends analysis may be conducted, regional bioassessment studies may be drawn from, or other means may be used to develop and support the assessment's conclusions.
7. Status of all multi-year efforts, including TMDL implementation, which were not completed in the current year and will continue into the subsequent year(s). Additionally, if any of the requested information cannot be obtained, a discussion of the factors(s) limiting its acquisition and steps that will be taken to improve future data collection efforts will be provided.

Non-stormwater Water Control Measures

The following information will be included to detail non-stormwater control measures:

1. An estimation of the number of major outfalls within the EWMP area.
2. The number of outfalls that were screened for significant non-stormwater discharges during the reporting year.
3. The cumulative number of outfalls that have been screened for significant non-stormwater discharges since the date the Permit was adopted through the reporting year.
4. The number of outfalls with confirmed significant non-stormwater discharge.
5. The number of outfalls where significant non-stormwater discharge was attributed to other NPDES permitted discharges; other authorized non-stormwater discharges; or conditionally exempt discharges.
6. The number of outfalls where significant non-stormwater discharges were abated as a result of the EWMP Group actions.
7. The number of outfalls where non-stormwater discharges was monitored.

8. The status of all multi-year efforts, including TMDL implementation, which were not completed in the current year and will continue into the subsequent year(s). Additionally, if any of the requested information cannot be obtained, a discussion of the factor(s) limiting its acquisition and steps that will be taken to improve future data collection efforts will be provided.

Effectiveness Assessment of Non-Stormwater Control Measures

The following information will be included to assess non-stormwater control measures effectiveness:

1. An assessment as to whether receiving water quality within the EMWP area is impaired, improving, staying the same or declining during the dry-weather conditions. Water quality data from the reporting year to previous years with similar dry-weather flows may be compared, a trends analysis may be conducted, regional bioassessment studies may be drawn from, or other means may be used to develop and support the assessment's conclusions.
2. An assessment of the effectiveness of the control measures in effectively prohibiting non-stormwater discharges through the MS4 to the receiving water.
3. The status of all multi-year efforts that were not completed in the current year and will continue into the subsequent year(s).

Integrated Monitoring Compliance Report

The following information will be included to assess the Permittee(s) compliance with applicable TMDLs, WQBELs, RWLs, and action levels:

1. An Integrated Monitoring Report that summarizes all identified exceedances of the following against applicable RWLs, WQBELs, non-stormwater action levels, and aquatic toxicity thresholds:
   a. Outfall-based stormwater monitoring data
   b. Wet weather receiving water monitoring data
   c. Dry weather receiving water data
   d. NSW outfall monitoring data

   All sample results that exceeded one more applicable thresholds shall be readily identified.
2. If aquatic toxicity was confirmed and a TIE was conducted, the toxic chemicals, as determined by the TIE, will be identified. All relevant data to allow the Regional Board to review the adequacy and findings of the TIE will be included. This shall include, but not be limited to:
   a. The sample(s) date
   b. Sample(s) start and end time
   c. Sample type(s)
   d. Sample location(s) as depicted on a map
   e. The parameters, analytical results, and applicable limitation.
3. A description of efforts that were taken to mitigate and/or eliminate all non-stormwater discharges that exceeded one or more applicable WQBELs, or caused or contributed to Aquatic Toxicity.
4. A description of efforts that were taken to address stormwater discharges that exceeded one or more applicable WQBELs, or caused or contributed to Aquatic Toxicity.
5. Where RWLs were exceeded, provide a description of efforts that were taken to determine whether discharges from the MS4 caused or contributed to the exceedances and all efforts that were taken to control the discharge of pollutants from the MS4 to those receiving waters in response to the

exceedances.

Adaptive Management Strategies

The following information will be included to outline Adaptive Management Strategies:

1. The most effective control measures, why the measures were effective, and how other measures will be optimized based on past experiences.
2. The least effective control measures, why the measures were deemed ineffective, and how the controls measures will be modified or terminated.
3. Significant changes to control measures during the prior year and the rationale for the changes.
4. All significant changes to control measures anticipated to be made next year and rationale for the changes. Those changes requiring approval of the Regional Board or its Executive Officer will be clearly identified at the beginning of the Annual Report.
5. A detailed description of control measures to be applied to New Development or Re-development projects disturbing more than 50 acres.
6. The status of all multi-year efforts that were not completed in the current year and will continue into the subsequent year(s).

Supporting Data and Information

All monitoring data and associated meta-data used to prepare the Annual Report will be summarized in an MS Excel© spreadsheet and sorted by monitoring station/outfall identifier linked to the EWMP area map. The data summary will include the date, sample type (flow-weighted composite, grab, field measurement), sample start and stop times, parameter, analytical method, value, and units. The date field will be linked to a database summarizing the weather data for the sampling date including 24-hour rainfall, rainfall intensity, and days since the previous rain event.

C-6.4 Signatory and Certification Requirements

All applications, reports, or information submitted to the Regional Board, State Board, and/or USEPA will be signed and certified as follows:

1. All applications submitted to the Regional Board shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer includes: (i) the chief executive officer of the agency (e.g., Mayor), or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., City Manager, Director of Public Works, City Engineer, etc.).
2. All reports required by the Permit and other information requested by the Regional Board, State Board, or USEPA shall be signed by either a principal executive officer or ranking elected official or by a duly authorized representative of a principal executive officer or ranking elected official. A person is a duly authorized representative only if:
    a. The authorization is made in writing by a principal executive officer or ranking elected official.
    b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an

individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

c. The written authorization is submitted to the Regional Board.

3. If an authorization of a duly authorized representative is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization will be submitted to the Regional Board prior to or together with any reports, information, or applications, to be signed by an authorized representative.
4. The following certification will be made by any person signing an application or report:
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

C-6.5 Use of Submitted Data

As stated in Part II.A.2 of the MRP, a Primary Objective of the Monitoring Program is to assess compliance with RWLs and WQBELs established to implement TMDL wet weather and dry weather wasteload allocations WLAs. As such, a discussion of how the compliance evaluation will be conducted is warranted and is presented below.

C-6.5.1 Compliance Evaluation

The compliance evaluation will take into consideration the relationship between the types of monitoring and the pathways for determining compliance outlined in the Permit. For example, the receiving water monitoring sites meet the MRP objectives and support an understanding of potential impacts associated with MS4 discharges. However, as described in the MRP (Part II.E.1), receiving water sites are intended to assess receiving water conditions. An exceedance of a RWL at a receiving water site does not on its own indicate MS4 discharges caused or contributed to the RWL exceedance. As the receiving water sites also receive runoff from non-MS4 sources, including open space and other permitted discharges, the exceedance of a RWL may have been caused or contributed to by a non-MS4 source. Additionally, an exceedance at an outfall location when the corresponding downstream receiving water location is in compliance with the water quality objectives and RWLs does not constitute an exceedance of a WQBEL.

Finally, reporting of compliance will be accomplished by evaluating the data, in addition to the status of EWMP implementation consistent with the Permit (Parts VI.C.2, VI.C.3 and VI.E.2). Generally, reporting of compliance will consider whether the following conditions, as applicable, are met:

1. There are no violations of the effective WQBEL (i.e., interim or final) for the specific pollutant at the Permittee's applicable MS4 outfall(s).
2. There are no exceedances of an applicable RWLs for the specific pollutant in the receiving water(s) at, or downstream of, the Permittee's outfall(s).
3. There is no direct or indirect discharge from the Permittee's MS4 to the receiving water during the

time period subject to the WQBEL and/or RWL for the pollutant(s) associated with a specific TMDL.
4. In drainage areas where Permittees are implementing an EWMP, (i) all non-stormwater and (ii) all stormwater runoff up to and including the volume equivalent to the 85th percentile, 24-hour event is retained for the drainage area tributary to the applicable receiving water.
5. The approved USGR EWMP is being implemented pursuant to Part VI.C of the Permit.
6. Conditions of effective Time Schedule Orders (TSOs) are met.
7. Exceedances of RWLs not otherwise addressed by a TMDL are addressed pursuant to Part VI.C.2 of the Permit.

In addition, evaluation of compliance for pollutants subject to TMDLs will consider the requirements specified in the applicable TMDLs described in the following subsections.

SGR Metals TMDL Interim Milestones Compliance Determination

Per the Metals TMDL, the EWMP Group is required to show increasing percentages of the total watershed meeting dry and wet weather WLAs phased over a 12-year period. **Table 22** lists the compliance milestone dates as well as the required percent compliance for the total watershed. The percent compliance for the EWMP Group will be calculated using an annual average. The annual average will be determined by averaging the total percentage for all of the sampling events occurring during an individual year to adequately characterize the dry or wet weather conditions for the reporting period.

Table 22. Compliance Milestone Dates and Required Percent Compliance

Compliance Milestone Date	Dry Weather Percent of Total Drainage Area Served by MS4 Meeting WLA	Wet Weather Percent of Total Drainage Area Served by MS4 Meeting WLA
September 30, 2017	30%	10%
September 30, 2020	70%	35%
September 30, 2023	100%	65%
September 30, 2026	100%	100%

Lakes TMDL Special Considerations

The East San Gabriel Valley WMP group is collecting the Stormwater samples required under the Lakes TMDL for Puddingstone Reservoir. The data collected at the LTA site of the receiving waters discharging into Puddingstone Reservoir will be used as reprehensive stormwater discharges to the reservoir. As detailed in the CIMP, the Lakes TMDL monitoring requirements specified in the MRP were considered when choosing the parameters. To estimate stormwater flows entering the lake, the rational method or the watershed model used to develop the EWMP will be used, and the chosen calculation method will be detailed in the Annual Report.

Use of Specie-Specific Data for Chlordanes, PCBs, and PAHs

Chlordanes, PCBs, and PAHs are unique in that they are pollutant categories which may be analyzed for the species that make up the pollutant category and the species of interest varies depending on the purpose of data collection. The individual constituents are summed to determine “total” concentrations. The following describes how individual chlordane, PCB, and PAH species will be summed for comparison to applicable WQBELs, RWLs, TMDL targets, WLAs, and/or State adopted objectives.

Analysis included in this CIMP for chlordane includes the following species: alpha-chlordane, gamma-chlordane, oxychlordane, cis-Nonachlor, and trans-Nonachlor. The calculation of total chlordane will be conducted as follows:

- When evaluating sediment concentrations and loads associated with the direct effects California Sediment Quality Objectives, quantified concentrations of alpha-chlordane, gamma-chlordane, trans-Nonachlor will be summed.
- When evaluating sediment concentrations and loads and tissue concentrations associated with indirect effects, quantified concentrations of alpha-chlordane, gamma-chlordane, oxychlordane, cis-Nonachlor, and trans-Nonachlor will be summed.
- Upon approval by the State Board, for the purposes of conducting analyses associated with the Decision Support Tool (DST) for determining impairment due to indirect effects associated with sediment concentrations, data for each species will be utilized in a manner consistent with the supporting documentation.

Analysis included in this CIMP for PCBs includes the following species: Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260 and congeners 8, 18, 28, 31, 33, 37, 44, 49, 52, 56, 60, 66, 70, 74, 77, 81, 87, 95, 97, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 132, 138, 141, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 174, 177, 180, 183, 187, 189, 194, 195, 201, 203, 206, and 209. The calculation of total PCBs will be conducted as follows:

- When evaluating water concentrations for the purposes of comparing to the California Toxics Rule (CTR) aquatic life criteria, quantified concentrations of aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260 will be summed.
- When evaluating water concentrations for the purposes of comparing to the CTR human health criteria, quantified concentrations of aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260 or congeners 8, 18, 28, 31, 33, 37, 44, 49, 52, 56, 60, 66, 70, 74, 77, 81, 87, 95, 97, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 132, 138, 141, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 174, 177, 180, 183, 187, 189, 194, 195, 201, 203, 206, and 209 will be summed.
- When evaluating sediment concentrations and loads associated with the direct effects California Sediment Quality Objectives, quantified concentrations of congeners 8,18, 28, 44, 52, 66, 101, 105, 118, 128, 138, 153, 170, 180, 187, 189, 195, 206, and 209 will be summed.
- When evaluating sediment and tissue samples associated with indirect effects, quantified concentrations of congeners 18, 28, 37, 44, 49, 52, 66, 70, 74, 77, 81, 87, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 138, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 177, 180, 183, 187, 189, 194, 201, and 206

will be summed

- Upon approval by the State Board, for the purposes of conducting analyses associated with the DST for determining impairment due to indirect effects associated with sediment concentrations, data for each species will be utilized in a manner consistent with the supporting documentation.

Analysis included in this CIMP for PAHs includes the following constituents: Benzo(a)pyrene, 3,4 Benzofluoranthene, Benzo(k)flouranthene, Chrysene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene. The calculation of total PAHs will be conducted as follows:

- When evaluating sediment and tissue samples associated with direct and indirect effects, quantified concentrations of Benzo(a)pyrene, 3,4 Benzofluoranthene, Benzo(k)flouranthene, Chrysene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene will be summed.
- Upon approval by the State Board, for the purposes of conducting analyses associated with the DST for determining impairment due to indirect effects associated with sediment concentrations, data for each species will be utilized in a manner consistent with the supporting documentation.

Appendix 1 Example Field and Chain-of-Custody Forms

EXAMPLE Field Log **Page 1 of 2**

GENERAL INFORMATION Date: __________

Site ID: ________________________________ Sampling Personnel: ________________________

GPS Coordinates: (lat) ____________________ (lon) ________________________ Picture/Video #: __________

OBSERVATIONS

Weather:____

Water Color:____________________________ In stream Activity:______________________________

Water Characteristics (flow type, odor, turbidity, floatables):____

Other comments (trash, wildlife, recreational uses, homeless activity, etc. – Use notes section if more room is needed):

____

***In situ* WATER QUALITY MEASUREMENTS**

Time	Temp (^{0}C)	pH	D.O. (mg/L)	D.O. % Sat	Elec Cond. (uS/cm)

COLLECTED WATER QUALITY SAMPLES

Sample ID	Analysis	Time	Volume	Notes
				Field blank
				Field duplicate

ADDITIONAL WATER QUALITY SAMPLING NOTES:

Example Field Log

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FLOW MEASUREMENTS WITH VELOCITY METER

Estimated Total Width of Flowing Water (ft): ____________ Distance measured from (circle): RIGHT or LEFT

Measurement Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Distance from Bank (ft)														
Depth (ft)														
Velocity (ft/s)														

FLOW MEASUREMENTS WITH FLOAT AND STOPWATCH Number of Flow Paths:______

Fill out Path # ✎	Path#	Path#	Path#	Path#	Path#
Width of Flow at **Top** of Marked Section:					
Width of Flow at **Middle** of Marked Section:					
Width of Flow at **Bottom** of Marked Section:					
Depth of Flow at 0% of **Top** Marked Section:					
Depth of Flow at 25% of **Top** Marked Section:					
Depth of Flow at 50% of **Top** Marked Section:					
Depth of Flow at 75% of **Top** Marked Section:					
Depth of Flow at 100% of **Top** Marked Section:					
Depth of Flow at 0% of **Middle** Marked Section:					
Depth of Flow at 25% of **Middle** Marked Section:					
Depth of Flow at 50% of **Middle** Marked Section:					
Depth of Flow at 75% of **Middle** Marked Section:					
Depth of Flow at 100% of **Middle** Marked Section:					
Depth of Flow at 0% of **Bottom** Marked Section					
Depth of Flow at 25% of **Bottom** Marked Section:					
Depth of Flow at 50% of **Bottom** Marked Section:					
Depth of Flow at 75% of **Bottom** Marked Section:					
Depth of Flow at 100% of **Bottom** Marked Section					
Distance Marked-off for Velocity:					
Time 1:					
Time 2:					
Time 3:					

Specify if measurements are in inches or feet using "in" or "ft"

FLOW MEASUREMENT WITH GRADUATED CONTAINER

Container Volume:_______________ Percent Capture:_________________

Time to fill container:

	Minutes	Seconds
Time1		
Time2		
Time3		

ADDITIONAL FLOW MEASUREMENT NOTES:

Example Chain-of-Custody Form

CHAIN-OF-CUSTODY RECORD Date: Lab ID:

Destination Lab:

Address:

Phone:

Fax:

Sampled By:

Contact:

Project:

Client Sample Id	Sample Date	Sample Time	Sample Matrix	Container #	Container Type	Container Pres.											Notes

Sender Comments:	Relinquished By (1):	Relinquished By (2):
	Signature:	
	Print:	
	Organization:	
	Date: Time:	Date: Time:
Laboratory Comments:	Received By (1):	Received By (2):
	Signature:	
	Print:	
	Organization:	
	Date: Time:	Date: Time:

Crew:

Appendix 2: Chapter 13 QA/QC Data Evaluation from Caltrans Guidance Manual: Stormwater Monitoring Protocols, 2nd Edition

SECTION 13
QA/QC DATA EVALUATION

All data reported by the analytical laboratory must be carefully reviewed to determine whether the project's data quality acceptability limits or objectives (DQOs) have been met. This section describes a process for evaluation of all laboratory data, including the results of all QA/QC sample analysis.

Before any results are reported by the laboratory, the deliverable requirements should be clearly communicated to the laboratory, as described in the "Laboratory Data Package Deliverables" discussion in ***Section 12***.

The current section discusses QA/QC data evaluation in the following two parts:

KEY TOPICS

- **Initial Data Quality Screening**
- **Data Quality Evaluation**

The initial data quality screening identifies problems with laboratory reporting while they may still be corrected. When the data reports are received, they should be immediately checked for conformity to chain of custody requests to ensure that all requested analyses have been reported. The data are then evaluated for conformity to holding time requirements, conformity to reporting limit requests, analytical precision, analytical accuracy, and possible contamination during sampling and analysis. The data evaluation results in rejection, qualification, and narrative discussion of data points or the data as a whole. Qualification of data, other than rejection, does not necessary exclude use of the data for all applications. It is the decision of the data user, based on specifics of the data application, whether or not to include qualified data points.

➤ INITIAL DATA QUALITY SCREENING

The initial screening process identifies and corrects, when possible, inadvertent documentation or process errors introduced by the field crew or the laboratory. The initial data quality control screening should be applied using the following three-step process:

1. *Verification check between sampling and analysis plan (SAP), chain of custody forms, and laboratory data reports*: Chain of custody records should be compared with field logbooks and laboratory data reports to verify the accuracy of all sample identification and to ensure that all samples submitted for analysis have a value reported for each parameter requested. Any deviation from the SAP that has not yet

been documented in the field notes or project records should be recorded and corrected if possible.

Sample representativeness should also be assessed in this step. The minimum acceptable storm capture parameters (number of aliquots and percent storm capture) per amount of rainfall are specified in ***Section 10***. Samples not meeting these criteria are generally not analyzed; however, selected analyses can be run at the Caltrans task manager's discretion. If samples not meeting the minimum sample representativeness criteria are analyzed, the resulting data should be rejected ("R") or qualified as estimated ("J"), depending upon whether the analyses were approved by Caltrans. Grab samples should be taken according to the timing protocols specified in the SAP. Deviations from the protocols will result in the rejection of the data for these samples or qualification of the data as estimated. The decision to reject a sample based on sample representativeness should be made prior to the submission of the sample to the laboratory, to avoid unnecessary analytical costs.

2. *Check of laboratory data report completeness*: As discussed in ***Section 12***, the end product of the laboratory analysis is a data report that should include a number of QA/QC results along with the environmental results. QA/QC sample results reported by the lab should include both analyses requested by the field crew (field blanks, field duplicates, lab duplicates and MS/MSD analysis), as well as internal laboratory QA/QC results (method blanks and laboratory control samples).

There are often differences among laboratories in terms of style and format of reporting. Therefore, it is prudent to request in advance that the laboratory conform to the style and format approved by Caltrans as shown in ***Section 14***. The Caltrans data reviewer should verify that the laboratory data package includes the following items:

- ✔ A narrative which outlines any problems, corrections, anomalies, and conclusions.
- ✔ Sample identification numbers.
- ✔ Sample extraction and analysis dates.
- ✔ Reporting limits for all analyses reported.
- ✔ Results of method blanks.
- ✔ Results of matrix spike and matrix spike duplicate analyses, including calculation of percent recovered and relative percent differences.
- ✔ Results of laboratory control sample analyses.
- ✔ Results of external reference standard analyses.
- ✔ Surrogate spike and blank spike analysis results for organic constituents.

✓ A summary of acceptable QA/QC criteria (RPD, spike recovery) used by the laboratory.

Items missing from this list should be requested from the laboratory.

3. *Check for typographical errors and apparent incongruities*: The laboratory reports should be reviewed to identify results that are outside the range of normally observed values. Any type of suspect result or apparent typographical error should be verified with the laboratory. An example of a unique value would be if a dissolved iron concentration has been reported lower than 500 μg/L for every storm event monitored at one location and then a value of 2500 μg/L is reported in a later event. This reported concentration of 2500 μg/L should be verified with the laboratory for correctness.

   Besides apparent out-of-range values, the indicators of potential laboratory reporting problems include:

   - Significant lack of agreement between analytical results reported for laboratory duplicates or field duplicates.
   - Consistent reporting of dissolved metals results higher than total or total recoverable metals.
   - Unusual numbers of detected values reported for blank sample analyses.
   - Inconsistency in sample identification/labeling.

   If the laboratory confirms a problem with the reported concentration, the corrected or recalculated result should be issued in an amended report, or if necessary the sample should be re-analyzed. If laboratory results are changed or other corrections are made by the laboratory, an amended laboratory report should be issued to update the project records.

➢ DATA QUALITY EVALUATION

The data quality evaluation process is structured to provide systematic checks to ensure that the reported data accurately represent the concentrations of constituents actually present in stormwater. Data evaluation can often identify sources of contamination in the sampling and analytical processes, as well as detect deficiencies in the laboratory analyses or errors in data reporting. Data quality evaluation allows monitoring data to be used in the proper context with the appropriate level of confidence.

QA/QC parameters that should be reviewed are classified into the following categories:

✔ Reporting limits

- ✔ Holding times
- ✔ Contamination check results (method, field, trip, and equipment blanks)
- ✔ Precision analysis results (laboratory, field, and matrix spike duplicates)
- ✔ Accuracy analysis results (matrix spikes, surrogate spikes, laboratory control samples, and external reference standards)

Each of these QA/QC parameters should be compared to data quality acceptability criteria, inalso known as the project's data quality objectives (DQOs). The key steps that should be adhered to in the analysis of each of these QA/QC parameters are:

1. Compile a complete set of the QA/QC results for the parameter being analyzed.
2. Compare the laboratory QA/QC results to accepted criteria (DQOs).
3. Compile any out-of-range values and report them to the laboratory for verification.
4. Prepare a report that tabulates the success rate for each QA/QC parameter analyzed.

This process should be applied to each of the QA/QC parameters as discussed below.

Reporting Limits

Stormwater quality monitoring program DQOs should contain a list of acceptable reporting limits that the lab is contractually obligated to adhere to, except in special cases of insufficient sample volume or matrix interference problems. The reporting limits used should ensure a high probability of detection. , Table 12-1 provides recommended reporting limits for selected parameters.

Holding Times

Holding time represents the elapsed time between sample collection time and sample analysis time. Calculate the elapsed time between the sampling time and start of analysis, and compare this to the required holding time. For composite samples that are collected within 24-hours or less, the time of the final sample aliquot is considered the "sample collection time" for determining sample holding time. For analytes with critical holding times (≤48 hours), composite samples lasting longer than 24-hours require multiple bottle composite samples. Each of these composite samples should represent less than 24 hours of monitored flow, and subsamples from the composites should have been poured off and analyzed by the laboratory for those constituents with critical holding times (***see Section 12***). It is important to review sample holding times to ensure that analyses occurred within the time period that is generally accepted to maintain stable parameter concentrations. Table 12-1 contains the holding times for selected parameters. If holding times are exceeded, inaccurate concentrations or false negative results may be reported.

Samples that exceed their holding time prior to analysis are qualified as “estimated”, or may be rejected depending on the circumstances.

Contamination

Blank samples are used to identify the presence and potential source of sample contamination and are typically one of four types:

1. ***Method blanks*** are prepared and analyzed by the laboratory to identify laboratory contamination.
2. ***Field blanks*** are prepared by the field crew during sampling events and submitted to the laboratory to identify contamination occurring during the collection or the transport of environmental samples.
3. ***Equipment blanks*** are prepared by the field crew or laboratory prior to the monitoring season and used to identify contamination coming from sampling equipment (tubing, pumps, bailers, etc.).
4. ***Trip blanks*** are prepared by the laboratory, carried in the field, and then submitted to the laboratory to identify contamination in the transport and handling of volatile organics samples.
5. ***Filter blanks*** are prepared by field crew or lab technicians performing the sample filtration. Blank water is filtered in the same manner and at the same time as other environmental samples. Filter blanks are used to identify contamination from the filter or filtering process.

If no contamination is present, all blanks should be reported as “not detected” or “non-detect” (e.g., constituent concentrations should not be detected above the reporting limit). Blanks reporting detected concentrations (“hits”) should be noted in the written QA/QC data summary prepared by the data reviewer. In the case that the laboratory reports hits on method blanks, a detailed review of raw laboratory data and procedures should be requested from the laboratory to identify any data reporting errors or contamination sources. When other types of blanks are reported above the reporting limit, a similar review should be requested along with a complete review of field procedures and sample handling. Often times it will also be necessary to refer to historical equipment blank results, corresponding method blank results, and field notes to identify contamination sources. This is a corrective and documentative step that should be done as soon as the hits are reported.

If the blank concentration exceeds the laboratory reporting limit, values reported for each associated environmental sample must be evaluated according to USEPA guidelines for data evaluations of organics and metals (USEPA, 1991; USEPA, 1995) as indicated in Table 13-1.

Table 13-1. USEPA Guidelines for Data Evaluation

Step	*Environmental Sample*	*Phthalates and other common contaminants*	*Other Organics*	*Metals*
1.	Sample > 10X blank concentration	No action	No action	No action
2.	Sample < 10X blank concentration	Report associated environmental results as “non-detect” at the reported environmental concentration.	No action	Results considered an “upper limit” of the true concentration (note contamination in data quality evaluation narrative).
3.	Sample < 5X blank concentration	Report associated environmental results as “non-detect” at the reported environmental concentration.	Report associated environmental results as “non-detect” at the reported environmental concentration.	Report associated environmental results as “non-detect” at the reported environmental concentration.

Specifically, if the concentration in the environmental sample is less than five times the concentration in the associated blank, the environmental sample result is considered, for reporting purposes, “not-detected” *at the environmental sample result concentration* (phthalate and other common contaminant results are considered non-detect if the environmental sample result is less than ten times the blank concentration). The laboratory reports are not altered in any way. The qualifications resulting from the data evaluation are made to the evaluator’s data set for reporting and analysis purposes to account for the apparent contamination problem. For example, if dissolved copper is reported by the laboratory at 4 μg/L and an associated blank concentration for dissolved copper is reported at 1 μg/L, data qualification would be necessary. In the data reporting field of the database (see ***Section 14***), the dissolved copper result would be reported as 4 μg/L), the numerical qualifier would be reported as “<”, the reporting limit would be left as reported by the laboratory, and the value qualifier would be reported as “U” (“not detected above the reported environmental concentration”).

When reported environmental concentrations are greater than five times (ten times for phthalates) the reported blank “hit” concentration, the environmental result is reported unqualified at the laboratory-reported concentration. For example, if dissolved copper is reported at 11 μg/L and an associated blank concentration for dissolved copper is reported at 1 μg/L, the dissolved copper result would still be reported as 11 μg/L.

Precision

Duplicate samples provide a measure of the data precision (reproducibility) attributable to sampling and analytical procedures. Precision can be calculated as the relative percent difference (RPD) in the following manner:

$$RPD_i = \frac{2 * |O_i - D_i|}{(O_i + D_i)} * 100\%$$

where:

RPD_i = Relative percent difference for compound i

O_i = Value of compound i in original sample

D_i = Value of compound i in duplicate sample

The resultant RPDs should be compared to the criteria specified in the project's DQOs. The DQO criteria shown in Table 13-2 below are based on the analytical method specifications and laboratory-supplied values. Project-specific DQOs should be developed with consideration to the analytical laboratory, the analytical method specifications, and the project objective. Table 13-2 should be used as a reference point as the least stringent set of DQO criteria for Caltrans monitoring projects.

Laboratory and Field Duplicates

Laboratory duplicates are samples that are split by the laboratory. Each half of the split sample is then analyzed and reported by the laboratory. A pair of field duplicates is two samples taken at the same time, in the same manner into two unique containers. Subsampling duplicates are two unique, ostensibly identical, samples taken from one composite bottle (see ***Section 10***). Laboratory duplicate results provide information regarding the variability inherent in the analytical process, and the reproducibility of analytical results. Field duplicate analysis measures both field and laboratory precision, therefore, it is expected that field duplicate results would exhibit greater variability than lab duplicate results. Subsampling duplicates are used as a substitute for field duplicates in some situations and are also an indicator of the variability introduced by the splitting process.

The RPDs resulting from analysis of both laboratory and field duplicates should be reviewed during data evaluation. Deviations from the specified limits, and the effect on reported data, should be noted and commented upon by the data reviewer. Laboratories typically have their own set of maximum allowable RPDs for laboratory duplicates based on their analytical history. In most cases these values are more stringent than those listed in Table 13-2. Note that the laboratory will only apply these maximum allowable RPDs to laboratory duplicates. In most cases field duplicates are submitted "blind" (with pseudonyms) to the laboratory.

Environmental samples associated with laboratory duplicate results greater than the maximum allowable RPD (when the numerical difference is greater than the reporting limit) are qualified as "J" (estimated). When the numerical difference is less than the RL, no qualification is necessary. Field duplicate RPDs are compared against the maximum allowable RPDs used for laboratory duplicates to identify any pattern of problems with reproducibility of results. Any significant pattern of RPD exceedances for field duplicates should be noted in the data report narrative.

Corrective action should be taken to address field or laboratory procedures that are introducing the imprecision of results. The data reviewer can apply "J" (estimated) qualifiers to any data points if there is clear evidence of a field or laboratory bias issue that is not related to contamination. (Qualification based on contamination is assessed with blank samples.)

Laboratories should provide justification for any laboratory duplicate samples with RPDs greater than the maximum allowable value. In some cases, the laboratory will track and document such exceedances, however; in most cases it is the job of the data reviewer to locate these out-of-range RPDs. When asked to justify excessive RPD values for field duplicates, laboratories most often will cite sample splitting problems in the field. Irregularities should be included in the data reviewer's summary, and the laboratory's response should be retained to document laboratory performance, and to track potential chronic problems with laboratory analysis and reporting.

Accuracy

Accuracy is defined as the degree of agreement of a measurement to an accepted reference or true value. Accuracy is measured as the percent recovery (%R) of spike compound(s). Percent recovery of spikes is calculated in the following manner:

$$\%R = 100\% * [(C_s - C) / S]$$

where:

$\%R$ = percent recovery

C_s = spiked sample concentration

C = sample concentration for spiked matrices

S = concentration equivalent of spike added

Accuracy (%R) criteria for spike recoveries should be compared with the limits specified in the project DQOs. A list of typical acceptable recoveries is shown in Table 13-2. As in the case of maximum allowable RPDs, laboratories develop acceptable criteria for an allowable range of recovery percentages that may differ from the values listed in Table 13-2.

Percent recoveries should be reviewed during data evaluation, and deviations from the specified limits should be noted in the data reviewer's summary. Justification for out of range recoveries should be provided by the laboratory along with the laboratory reports, or in response to the data reviewer's summary.

Laboratory Matrix Spike and Matrix Spike Duplicate Samples

Evaluation of analytical accuracy and precision in environmental sample matrices is obtained through the analysis of laboratory matrix spike (MS) and matrix spike duplicate (MSD) samples. A matrix spike is an environmental sample that is spiked with a known amount of the constituent being analyzed. A percent recovery can be calculated from the results of the spike analysis. A MSD is a duplicate of this analysis that is performed as a check on matrix recovery precision. MS and MSD results are used together to calculate RPD as with the duplicate samples. When MS/MSD results (%R and RPD) are outside the project specifications, as listed in Table 13-2, the associated environmental samples are qualified as "estimates due to matrix interference". Surrogate standards are added to all environmental and QC samples tested by gas chromatography (GC) or gas chromatography-mass spectroscopy (GC-MS). Surrogates are non-target compounds that are analytically similar to the analytes of interest. The surrogate compounds are spiked into the sample prior to the extraction or analysis. Surrogate recoveries are evaluated with respect to the laboratory acceptance criteria to provide information on the extraction efficiency of every sample.

External Reference Standards

External reference standards (ERS) are artificial certified standards prepared by an external agency and added to a batch of samples. ERS's are not required for every batch of samples, and are often only run quarterly by laboratories. Some laboratories use ERS's in place of laboratory control spikes with every batch of samples. ERS results are assessed the same as laboratory control spikes for qualification purposes (see below). The external reference standards are evaluated in terms of accuracy, expressed as the percent recovery (comparison of the laboratory results with the certified concentrations). The laboratory should report all out-of-range values along with the environmental sample results. ERS values are qualified as biased high" when the ERS recovery exceeds the acceptable recovery range and "biased low" when the ERS recovery is smaller than the recovery range.

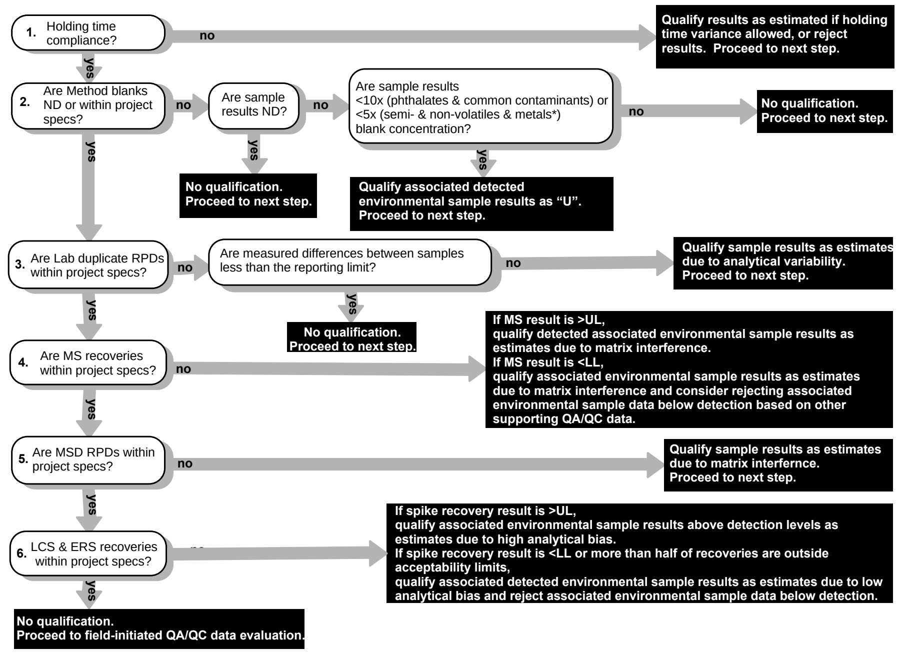
Laboratory Control Samples

LCS analysis is another batch check of recovery of a known standard solution that is used to assess the accuracy of the entire recovery process. LCSs are much like ERS's except that a certified standard is not necessarily used with LCSs, and the sample is prepared internally by the laboratory so the cost associated with preparing a LCS sample is much lower than the cost of ERS preparation. LCSs are reviewed for percent recovery within control limits provided by the laboratory. LCS out-of-range values are treated in the same manner as ERS out-of-range values. Because LCS and ERS analysis both check the entire recovery process, any irregularity in these results supersedes other accuracy-related qualification. Data are rejected due to low LCS recoveries when the associated environmental result is below the reporting limit.

A flow chart of the data evaluation process, presented on the following pages as Figures 13-1 (lab-initiated QA/QC samples) and 13-2 (field-initiated QA/QC), can be used as a general guideline for data evaluation. Boxes shaded black in Figures 13-1 and 13-2 designate final results of the QA/QC evaluation.

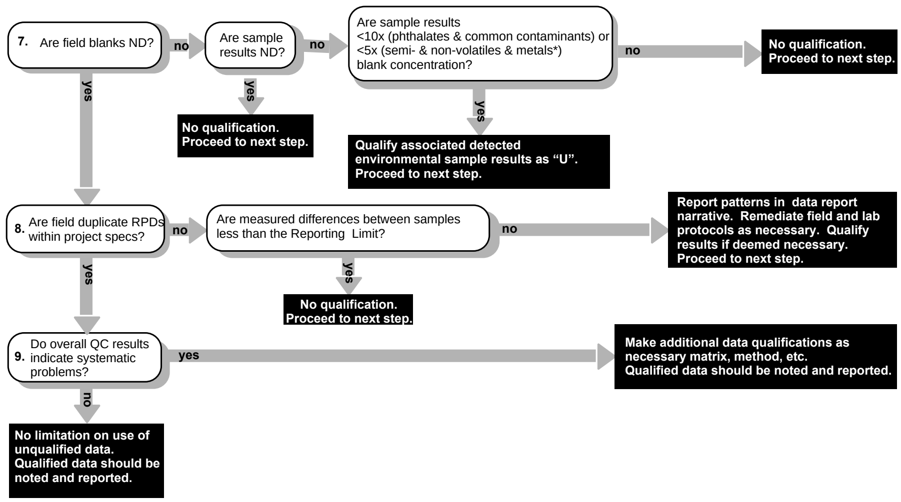
Table 13-2. Typical Control Limits for Precision and Accuracy for Analytical Constituents

Analyte	*EPA Method Number or Standard Method*	*Maximum Allowable RPD*	*Recovery Upper Limit*	*Recovery Lower Limit*
Conventionals				
BOD	405.1; SM 5210B	20%	80%	120%
COD	410.1; 410.4; SM 5220C; SM 5220D	20%	80%	120%
Hardness	130.2; 130.1; SM 2340B	20%	80%	120%
pH	150.1	20%	NA	NA
TOC/DOC	415.1	15%	85%	115%
TDS	160.1	20%	80%	120%
TSS	160.2	20%	80%	120%
Turbidity	180.1	20%	NA	NA
Nutrients				
NH3-N	350.2; 350.3	20%	80%	120%
NO3-N	300.0	20%	80%	120%
NO2-N	300.0	20%	80%	120%
NO3/NO2-N	353.2	20%	80%	120%
P	365.2	20%	80%	120%
Ortho-P	365.2; 365.3	20%	80%	120%
TKN	351.3	20%	80%	120%
Metals				
Ag	272.2; 200.8	20%	75%	125%
Al	200.9; 200.8	20%	75%	125%
Cd	213.2; 200.8	20%	75%	125%
Cr	218.2; 200.8	20%	75%	125%
Cu	220.2; 200.8	20%	75%	125%
Ni	249.2; 200.8	20%	75%	125%
Pb	239.2; 200.8	20%	75%	125%
Zn	289.2; 200.8	20%	75%	125%
As	206.3; 200.8	20%	75%	125%
Fe	200.9; SM 3500-Fe B	20%	75%	125%
Se	200.9; 270.3; 200.8	20%	75%	125%
Hg	1631	21%	79%	121%
Total Petroleum Hydrocarbons				
TPH (gasoline)		21%	45%	129%
TPH (diesel)	8015b	21%	45%	129%
TPH (motor oil)		21%	45%	129%
Oil & Grease	1664	18%	79%	114%
Pesticides and Herbicides				
Glyphosate	547	30%	70%	130%
OP Pesticides (esp. diazinon and chlorpyrifos)	8141; ELISA	25%		
OC Pesticides	8081	25%	see method for constituent specific	
Chlorinated Herbicides	8150; 8151	25%		
Carbamate Pesticides	8321	25%		
Miscellaneous Organic Constituents				
Base/Neutrals and Acids	625; 8270	30% to 50% (analyte dependent)	see method for constituent specific	
PAHs	8310			
Purgeables	624; 8260	20%		
Purgeable Halocarbons	601	30%	see method, Table 2	
Purgeable Aromatics	602	20%	see method for constituent specific	
Miscellaneous Constituents				
Cyanide	335.2	20%	75	125
Bacteriological				
Fecal Coliform	SM 9221E	-	-	-
Total Coliform	SM 9221B	-	-	-



*Environmental results between 5x and 10x the blank concentration are qualified as "an upper limit on the true concentration" and the data user should be cautioned.

Figure 13-1. Technical Data Evaluation for Lab-Initiated QA/QC Samples



*Environmental results between 5x and 10x the blank concentration are qualified as "an upper limit on the true concentration" and the data user should be cautioned.

Figure 13-2. Technical Data Evaluation for Field-Initiated QA/QC Samples

Attachment D
Water Quality Objectives

Constituent	Units	Basin Plan		CTR			EPA 304(a) criteria
		Min non-MUN	Min MUN	Min non-MUN fresh	Min non-MUN salt	Min MUN fresh	
1,1,1-Trichloroethane	µg/L		200				
1,1,2,2-Tetrachloroethane	µg/L		1	11	11	0.17	
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L		1200				
1,1,2-Trichloroethane	µg/L		5	42	42	0.6	
1,1-Dichloroethane	µg/L		5				
1,1-Dichloroethylene	µg/L		6	3.2	3.2	0.057	
1,2,4-Trichlorobenzene	µg/L		70				
1,2-Dibromo-3-Chloropropane	µg/L		0.2				
1,2-Dichlorobenzene	µg/L		600	17000	17000	2700	
1,2-Dichloroethane	µg/L		0.5	99	99	0.38	
1,2-Dichloropropane	µg/L		5	39	39	0.52	
1,2-Diphenylhydrazine	µg/L			0.54	0.54	0.04	
1,2-Trans-Dichloroethylene	µg/L		10	140000	140000	700	
1,3-Dichlorobenzene	µg/L			2600	2600	400	
1,3-Dichloropropylene	µg/L		0.5	1700	1700	10	
1,4-Dichlorobenzene	µg/L		5	2600	2600	400	
2,3,7,8-TCDD (Dioxin)	pg/L		30	0.014	0.014	0.013	
2,4,5-TP	µg/L		50				
2,4,6-Trichlorophenol	µg/L			6.5	6.5	2.1	
2,4-D	µg/L		70				
2,4-Dichlorophenol	µg/L			790	790	93	
2,4-Dimethylphenol	µg/L			2300	2300	540	
2,4-Dinitrophenol	µg/L			14000	14000	70	
2,4-Dinitrotoluene	µg/L			9.1	9.1	0.11	
2-Chloronaphthalene	µg/L			4300	4300	1700	
2-Chlorophenol	µg/L			400	400	120	
2-Methyl-4,6-Dinitrophenol	µg/L			765	765	13.4	
3,3'-Dichlorobenzidine	µg/L			0.077	0.077	0.04	
4,4'-DDD	µg/L			0.00084	0.00084	0.00083	
4,4'-DDE	µg/L			0.00059	0.00059	0.00059	
4,4'-DDT	µg/L			0.00059	0.00059	0.00059	0.001 G, ii
Acenaphthene	µg/L			2700	2700	1200	
Acrolein	µg/L			780	780	320	3ug/L
Acrylonitrile	µg/L			0.66	0.66	0.059	
Alachlor	µg/L		2				
Aldrin	µg/L			0.00014	0.00014	0.00013	0
alpha-BHC	µg/L			0.013	0.013	0.0039	
alpha-Endosulfan	µg/L			0.056	0.0087	0.056	0.056 G, Y
Aluminum	µg/L		1000				
Ammonia (Total) as N	mg/L	0.035	0.035				
Ammonia as N	mg/L	2.23	2.23				
Anthracene	µg/L			110000	110000	9600	
Antimony	µg/L		6	4300	4300	14	
Aroclors	µg/L	0.00007	0.00007	0.00017	0.00017	0.00017	
Arsenic	µg/L		50	150	36	150	150 A, D
Asbestos	MFL		7	0	0	7	
Atrazine	µg/L		3				
Barium	µg/L		1000				
Bentazon	µg/L		18				
Benzene	µg/L		1	71	71	1.2	
Benzidine	µg/L			0.00054	0.00054	0.00012	
Benzo(a)Anthracene	µg/L			0.049	0.049	0.0044	
Benzo(a)Pyrene	µg/L		0.2	0.049	0.049	0.0044	
Benzo(b)Fluoranthene	µg/L			0.049	0.049	0.0044	
Benzo(k)Fluoranthene	µg/L			0.049	0.049	0.0044	
Beryllium	µg/L		4	0	0	0	
beta-BHC	µg/L			0.046	0.046	0.014	
beta-Endosulfan	µg/L			0.056	0.0087	0.056	0.056 G, Y
Bioaccumulation							
Biostimulatory Substances							
Bis(2-chloroethyl)Ether	µg/L			1.4	1.4	0.031	
Bis(2-chloroisopropyl)Ether	µg/L			170000	170000	1400	
Bis(2-ethylhexyl)Adipate	µg/L		400				
Bis(2-ethylhexyl)Phthalate	µg/L		4	5.9	5.9	1.8	
BOD	mg/L						
Boron	mg/L						0
Bromoform	µg/L			360	360	4.3	
Butylbenzyl Phthalate	µg/L			5200	5200	3000	
Cadmium	µg/L		5	2.2	9.3	2.2	0.25 D, E
Carbofuran	µg/L		18				
Carbon Tetrachloride	µg/L		0.5	4.4	4.4	0.25	
Chemical Constituents							
Chlordanes	µg/L		0.1	0.00059	0.00059	0.00057	
Chloride	mg/L						230000
Chlorine (Total Residual)	µg/L		100				

Constituent	Units	Basin Plan		CTR			EPA 304(a) criteria
		Min non-MUN	Min MUN	Min non-MUN fresh	Min non-MUN salt	Min MUN fresh	
Chlorobenzene	µg/L		70	21000	21000	680	
Chlorodibromomethane	µg/L			34	34	0.41	
Chromium	µg/L		50				
Chromium (III)	µg/L			180		180	74 D, E
Chromium (VI)	µg/L			11	50	11	11 D
Chrysene	µg/L			0.049	0.049	0.0044	
cis-1,2-Dichloroethylene	µg/L		6				
Color							0
Copper	µg/L			9	3.1	9	4.8 D, cc
Cyanide	µg/L		200	5.2	1	5.2	5.2 Q
Dalapon	µg/L		200				
Dibenzo(a,h)Anthracene	µg/L			0.049	0.049	0.0044	
Dichlorobromomethane	µg/L			46	46	0.56	
Dieldrin	µg/L			0.00014	0.00014	0.00014	0.056 O
Diethyl Phthalate	µg/L			120000	120000	23000	
Dimethyl Phthalate	µg/L			2900000	2900000	313000	
Di-n-Butyl Phthalate	µg/L			12000	12000	2700	
Dinoseb	µg/L		7				
Diquat	µg/L		20				
Dissolved Oxygen	mg/L	5	5				
E. Coli	MPN/100mL	126	126				
Endosulfan Sulfate	µg/L			240	240	110	
Endothall	µg/L		100				
Endrin	µg/L		2	0.036	0.0023	0.036	0.036 O
Endrin Aldehyde	µg/L			0.81	0.81	0.76	
Enterococcus	MPN/100mL	35	35				
Ethylbenzene	µg/L		700	29000	29000	3100	
Ethylene Dibromide	µg/L		0.05				
Exotic Vegetation							
Fecal Coliform	MPN/100mL	200	200				
Floating Material							
Fluoranthene	µg/L			370	370	300	
Fluorene	µg/L			14000	14000	1300	
Fluoride	mg/L		2				
gamma-BHC (Lindane)	µg/L		0.2	0.063	0.063	0.019	0
Glyphosate	µg/L		700				
Gross Alpha particle activity	pCi/L		15				
Gross Beta particle activity	pCi/L		50				
Habitat							
Heptachlor	µg/L		0.01	0.00021	0.00021	0.00021	0.0038 G
Heptachlor Epoxide	µg/L		0.01	0.00011	0.00011	0.0001	0.0038 G, V
Hexachlorobenzene	µg/L		1	0.00077	0.00077	0.00075	
Hexachlorobutadiene	µg/L			50	50	0.44	
Hexachlorocyclopentadiene	µg/L		50	17000	17000	240	
Hexachloroethane	µg/L			8.9	8.9	1.9	
Hydrology							
Indeno(1,2,3-cd)Pyrene	µg/L			0.049	0.049	0.0044	
Isophorone	µg/L			600	600	8.4	
Lead	µg/L			2.5	8.1	2.5	2.5 D, E
MBAS	µg/L		500				
Mercury	µg/L		2	0.051	0.051	0.05	0.77 D, hh
Methoxychlor	µg/L		40				0.03 C
Methyl Bromide	µg/L			4000	4000	48	
Methylene Chloride	µg/L		5	1600	1600	4.7	
Molinate	µg/L		20				
Nickel	µg/L		100	52	8.2	52	52 D, E
Nitrate as N	mg/L		10				
Nitrate as NO3	mg/L		45				
Nitrite as N	mg/L		1				
Nitrobenzene	µg/L			1900	1900	17	
Nitrogen (NO3-N+NO2-N)	mg/L		10				
N-Nitrosodimethylamine	µg/L			8.1	8.1	0.00069	
N-Nitrosodi-n-Propylamine	µg/L			1.4	1.4	0.005	
N-Nitrosodiphenylamine	µg/L			16	16	5	
Oil + Grease	mg/L						
Oxamyl	µg/L		200				
PCBs	µg/L			0.00017	0.00017	0.00017	
Pentachlorophenol	µg/L		1	8.2	7.9	0.28	15 F
pH	pH Units	6.5	6.5				6.5 – 9 C
Phenol	µg/L			4600000	4600000	21000	
Picloram	µg/L		500				
Pyrene	µg/L			11000	11000	960	
Radioactive Substances	pCi/L						
Radium-226 + Radium-228	pCi/L		5				
Ratio Fecal/Total Coliform							
Selenium	µg/L		50	5	71	5	5.0 R

Constituent	Units	Basin Plan		CTR			EPA 304(a) criteria
		Min non-MUN	Min MUN	Min non-MUN fresh	Min non-MUN salt	Min MUN fresh	
Silver	µg/L			3.4	1.9	3.4	0
Simazine	µg/L		4				
Strontium-90	pCi/L		8				
Styrene	µg/L		100				
Sulfate	mg/L						
Taste and Odor							
TDS	mg/L						
Temperature	°C	26.7	26.7				0
Tetrachloroethylene	µg/L		5	8.85	8.85	0.8	
Thallium	µg/L		2	6.3	6.3	1.7	
Thiobencarb	µg/L		70				
Toluene	µg/L		150	200000	200000	6800	
Total Coliform	MPN/100mL	70	70				
Total Settleable Solids							
Toxaphene	µg/L		3	0.0002	0.0002	0.0002	0.0002
Toxicity							
Trichloroethylene	µg/L		5	81	81	2.7	
Trichlorofluoromethane	µg/L		150				
Tritium	pCi/L		20000				
TSS	mg/L						
Turbidity	NTU						
Uranium	pCi/L		20				
Vinyl Chloride	µg/L		0.5	525	525	2	
Xylenes (Total)	µg/L		1750				
Zinc	µg/L			120	81	120	120 D, E

Attachment E
Stormwater Outfall Selection

E-1 STORMWATER OUTFALL SITE SELECTION

The primary criterion cited in the MRP for selection of monitoring sites for the stormwater outfall monitoring program is that the sites are representative of the range of land uses in the area. An additional stated criterion for site selection is the ability to accurately measure flows for pollutant loads characterization. Flow measurement is easily addressed by physical assessment of the site conditions and consideration of access to the site. The primary criterion in the MRP implies an assessment of variation of land uses within the WMA, potential variation in water quality issues for different HUC-12 drainages, and geographic variation in factors influencing runoff quality.

The Permit-defined specific objectives for the stormwater outfall monitoring are as follows:.

- Determine the quality of discharge relative to municipal action levels
- Determine whether the discharge is in compliance with WQBELs derived from TMDL WLAs
- Determine whether a discharge causes or contributes to exceedances of receiving water limitations (RWL).

The default approach in the MRP to achieving adequate representation is to select one major outfall in each hydrological unit (HUC–12) within each individual Permittee's jurisdiction. Consequently, the minimum number of outfalls required for monitoring under the default approach is equal to the total number of unique combinations of HUC-12s and jurisdictions. The default approach is geared toward ensuring adequate accountability and representation if the Permittees monitor as individual entities, but would result in monitoring more outfall discharges than needed for efforts coordinated among the USGR EWMP Group. For the San Gabriel River WMA, there would be 16 stormwater outfalls using the default approach.

As an alternative to the MRP's default monitoring approach, the EWMP Group is proposing to monitor one major outfall for each Group Member in the WMA. The resulting data would be considered representative of Group Members' discharge in their respective jurisdictions, would provide representative results needed to meet all three specific monitoring objectives, and would also provide the basis for stormwater management decisions for all Group Members. The rationale supporting the EWMP Group's alternative approach follows.

E-2 REPRESENTATIVENESS OF SELECTED OUTFALLS

The principal criterion for the site selection for stormwater outfall monitoring is that sites are representative of the range of land uses in the WMA. The drainages within the EWMP Group's WMA are comprised primarily of residential, commercial, and industrial land uses, with minimal percentages of agriculture and undeveloped open space. The six proposed outfalls were selected specifically to characterize runoff from drainages that are representative of the mix of these primary land uses in the WMA, and to minimize contributions from other land uses. Land use summaries for the USGR EWMP Group are listed in **Table E-1**. Pictures and drainage area maps for the selected stormwater outfall sites can be found in **Section B-2**.

Table E-1.
Relative Land Use Area within Drain Area to Stormwater Outfall Sites

Group Member	Area	Percent of Land Area(1)			
		Res	Com/Ind	Ag/Nur	Open
Baldwin Park	Jurisdiction	66	31	2	1
	BI 1701-Line A	75	24	0	1
Covina	Jurisdiction	65	32	<1	2
	BI 1123	66	31	0	3
Glendora	Jurisdiction	70	20	1	8
	BI 3701-Line C	90	8	1	1
Industry	Jurisdiction	<1	91	3	6
	BI 4301-Industry	5	92	0	3
La Puente	Jurisdiction	72	25	<1	3
	BI 4801-Line B	64	26	0	10
County of Los Angeles	Jurisdiction	68	20	2	11
	PD 2425	71	28	0	1

1 Land use classifications include: residential (res), commercial and industrial (com/ind), agriculture and nursery (ag/nur), and open space (open). Totals correspond to the percent of the MS4 area considered in the EWMP.

E-3 STORMWATER MONITORING DATA VARIABILITY

The inter-event variability (e.g., for different storm events) in stormwater discharge quality is much greater than between individual outfall drainages or major land uses. Based on stormwater monitoring results from other programs, discharge quality from drainages with similar mixed land uses is not substantially different, and it will be impossible to distinguish statistically between drainages with a reasonable amount of monitoring because of the high variability in discharge quality for each site. The statistical power analysis based on the range of typical stormwater discharge quality distributions and the number of sample collected for the permit term, 15 samples per site, is enumerated in **Table E-2**. For example, the analysis results in an average difference between sites would need to be greater than 62% to be detected with 95% confidence and 80% power for a pollutant with a fairly "typical" coefficient of variance (COV) of 0.66. COVs for stormwater discharge quality are generally greater than 0.2 and commonly exceed 1.0. Programmatically meaningful differences (i.e., differences between sites as small as 20%) would not be expected to be detected for most constituents over the time frame of the permit.

Given the high variability typical of stormwater pollutant levels, and with only a few storm events that can be collected per year, it will not be possible to make *meaningful* distinctions between drainages, either within land use types, across land use types, or between jurisdictions. Management implementation by the Permittees is also expected to be relatively consistent throughout the WMA, so additional focus on geographic differences is not necessary. This means that only a handful of sites are needed to adequately characterize residential land use discharge quality within the WMA. Consequently, sampling more than a few representative sites is unlikely to significantly improve characterization of runoff quality, or to better inform the EWMP Group's management decisions.

Realistically achievable changes in stormwater runoff quality or loads (e.g., 20–50% reductions) are statistically demonstrable only over relatively long periods of time (≥10 years). This is also due to the high variability between events and the relatively few number of events that can be sampled each season, and additional monitoring sites will do little to improve the statistical power of such trend analysis within the permit time frame compared to longer periods of evaluation. This also supports the need to assess management effectiveness and compliance based primarily on successful implementation actions rather than explicit demonstration of improvements in runoff quality.

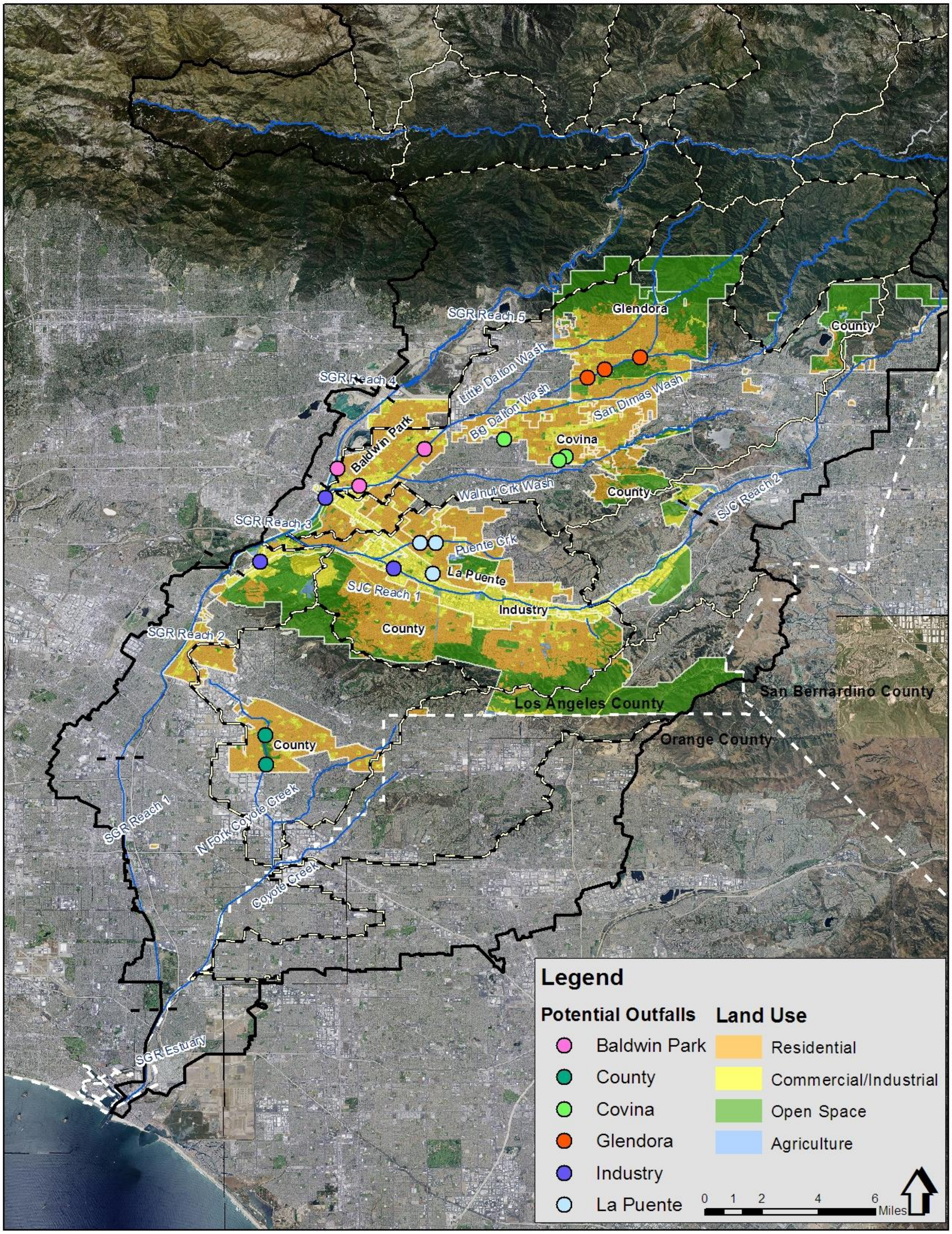
E-4 Recommendation for Stormwater Outfall Site Selection

Based on the evaluations above, the EWMP Group's proposed CIMP approach to monitor one outfall for each Group Member in the WMA will provide the representative data needed to meet the specific permit objectives for stormwater outfall monitoring and support management decisions of the EWMP Group. Additional monitoring sites within six Group Member jurisdictions will not provide significant improvements in representation or characterization of discharge quality, or additional information for discharge quality management.

Table E-2.
Detectible Significant Percent Differences between Sites

Sample Size = 15, alpha = 0.05		
COV	**power=0.8**	**power 0.9**
0.20	21%	24%
0.31	32%	36%
0.42	42%	48%
0.53	52%	59%
0.66	62%	70%
0.80	71%	81%
0.95	80%	91%
1.12	89%	100%
1.31	97%	109%

Attachment F
Stormwater Outfall Sites (Including Potential Alternates)


Glendora
County
SGR Reach 5
SGR Reach 4
Little Dalton Wash
Big Dalton Wash
San Dimas Wash
Baldwin Park
Covina
Walnut Crk Wash
County
SJC Reach 2
SGR Reach 3
Puente Crk
La Puente
SJC Reach 1
Industry
County
SGR Reach 2
San Bernardino County
Los Angeles County
Orange County
County
SGR Reach 1
N Fork Coyote Creek
Coyote Creek
SGR Estuary
Legend
Potential Outfalls
Baldwin Park
County
Covina
Glendora
Industry
La Puente
Land Use
Residential
Commercial/Industrial
Open Space
Agriculture
0 1 2 4 6
Miles

F-1 CITY OF BALDWIN PARK POTENTIAL OUTFALLS

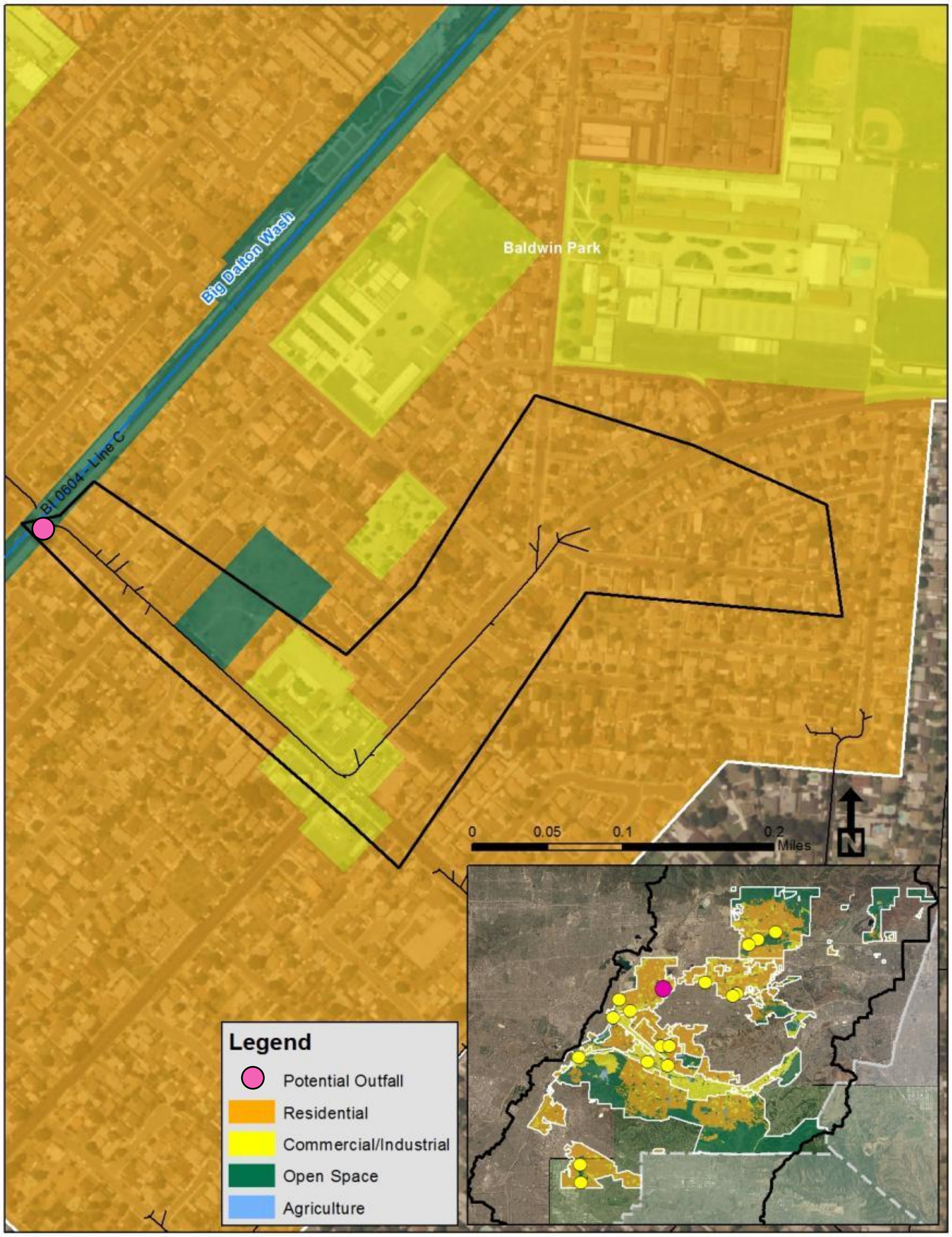
Table 1. Potential Wet Weather Outfall Monitoring Sites – City of Baldwin Park

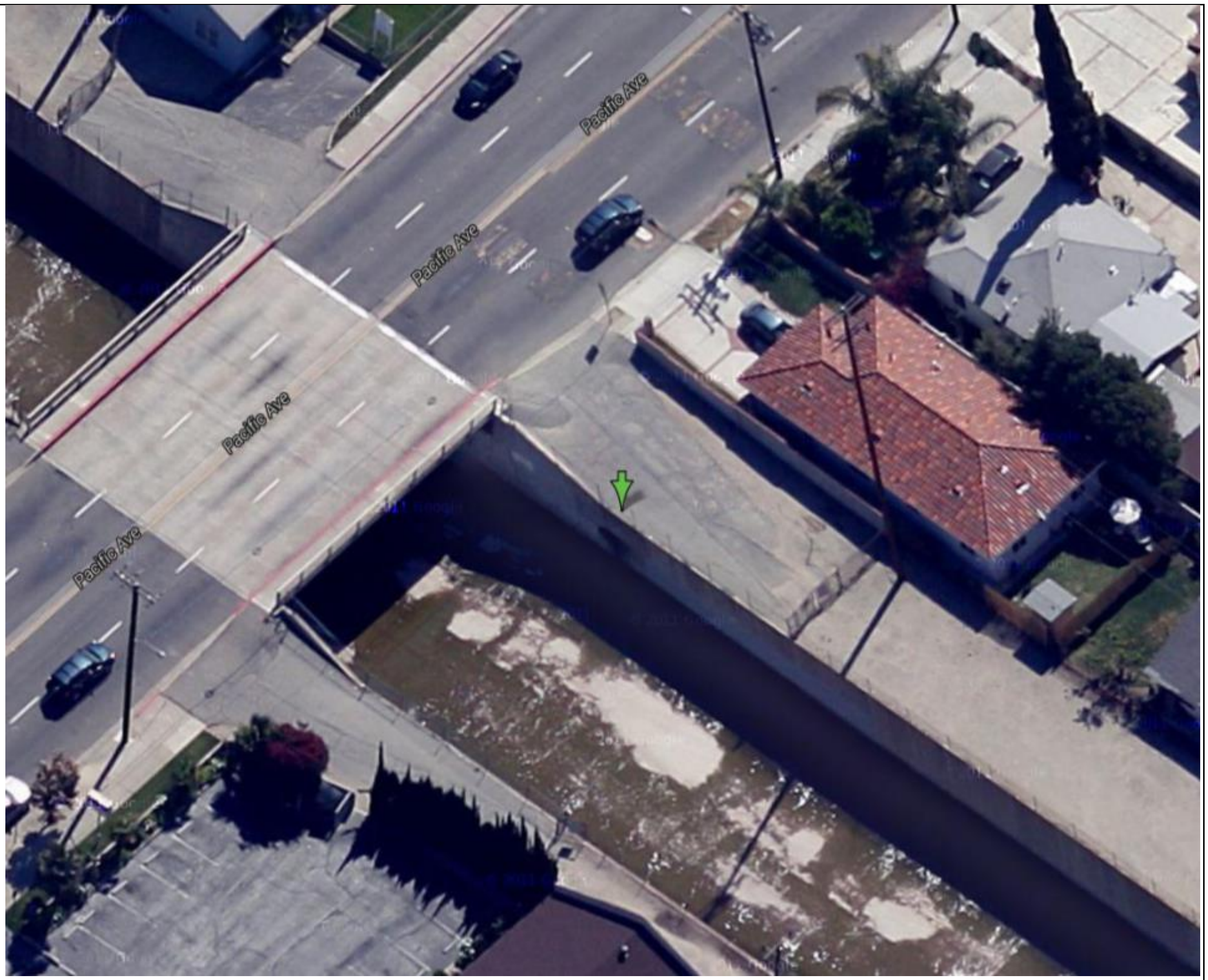
Water Body	Jurisdiction	Drain Name	Size	Shape	Material	Lat	Lon
Big Dalton Wash	Baldwin Park	BI 0604 - Line C	66”	Round	Reinforced Conc. Pipe	34.081651	-117.955909
Walnut Creek	Baldwin Park	BI 1701 - Line A	126”	Square or Rectangle	Reinforced Conc. Box	34.062694	-117.988920
SGR Reach 4	Baldwin Park	BI 9705	96”	Square or Rectangle	Reinforced Conc. Box	34.071568	-118.00019

F-1.1 BI 0604 - Line C

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Big Dalton Wash	Baldwin Park	BI 0604 - Line C	66 inches	SW Outfall	34.081651	-117.955909

General Description: New SW outfall monitoring site discharging to Big Dalton Wash downstream of Pacific Ave.



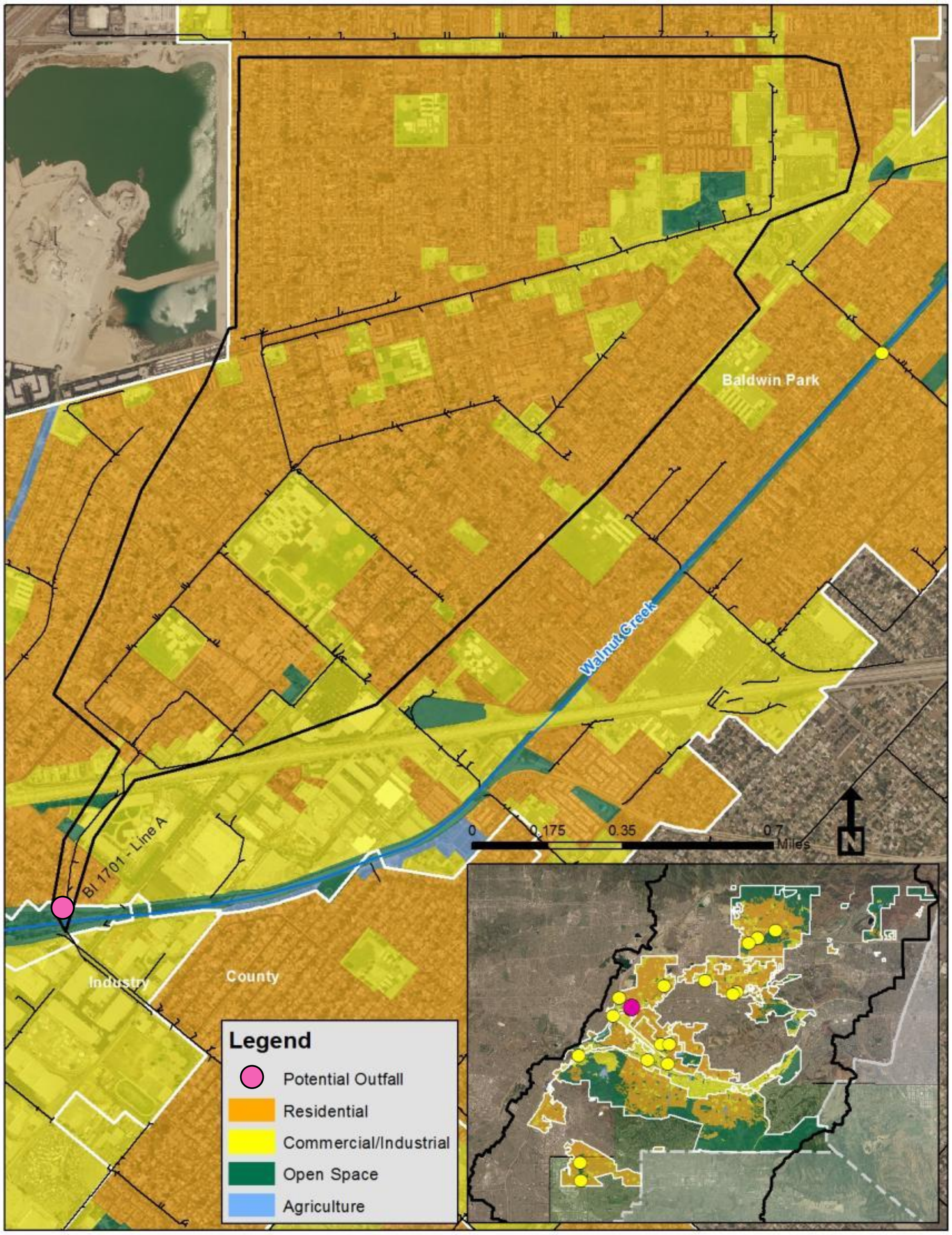


BI 0604 – Line C Aerial View

F-1.2 BI 1791 – Line A

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Walnut Creek	Baldwin Park	BI 1701 - Line A	126 inches	SW Outfall	34.062694	-117.988920

General Description: New SW outfall monitoring site discharging to Walnut Creek downstream of Baldwin Park Blvd.

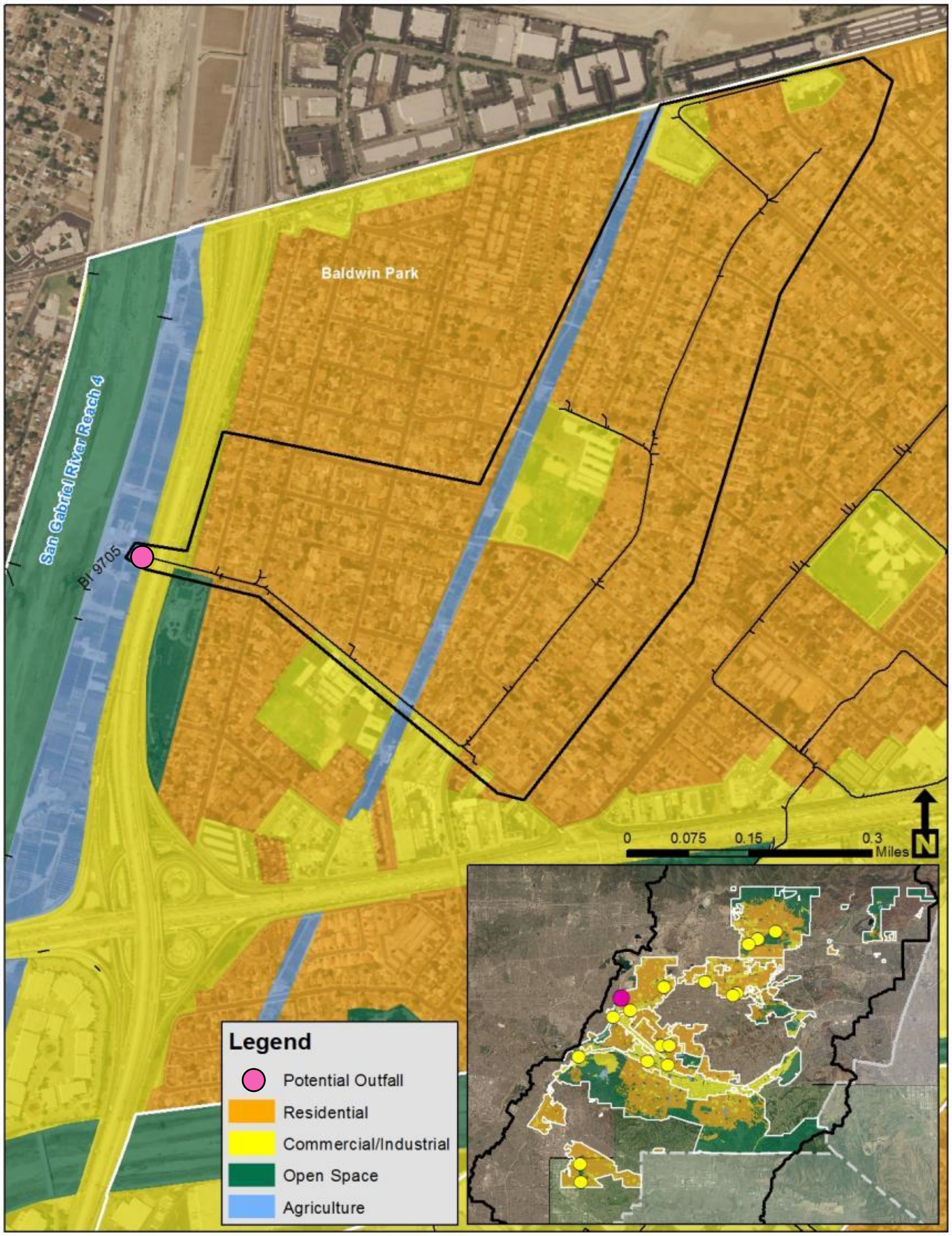


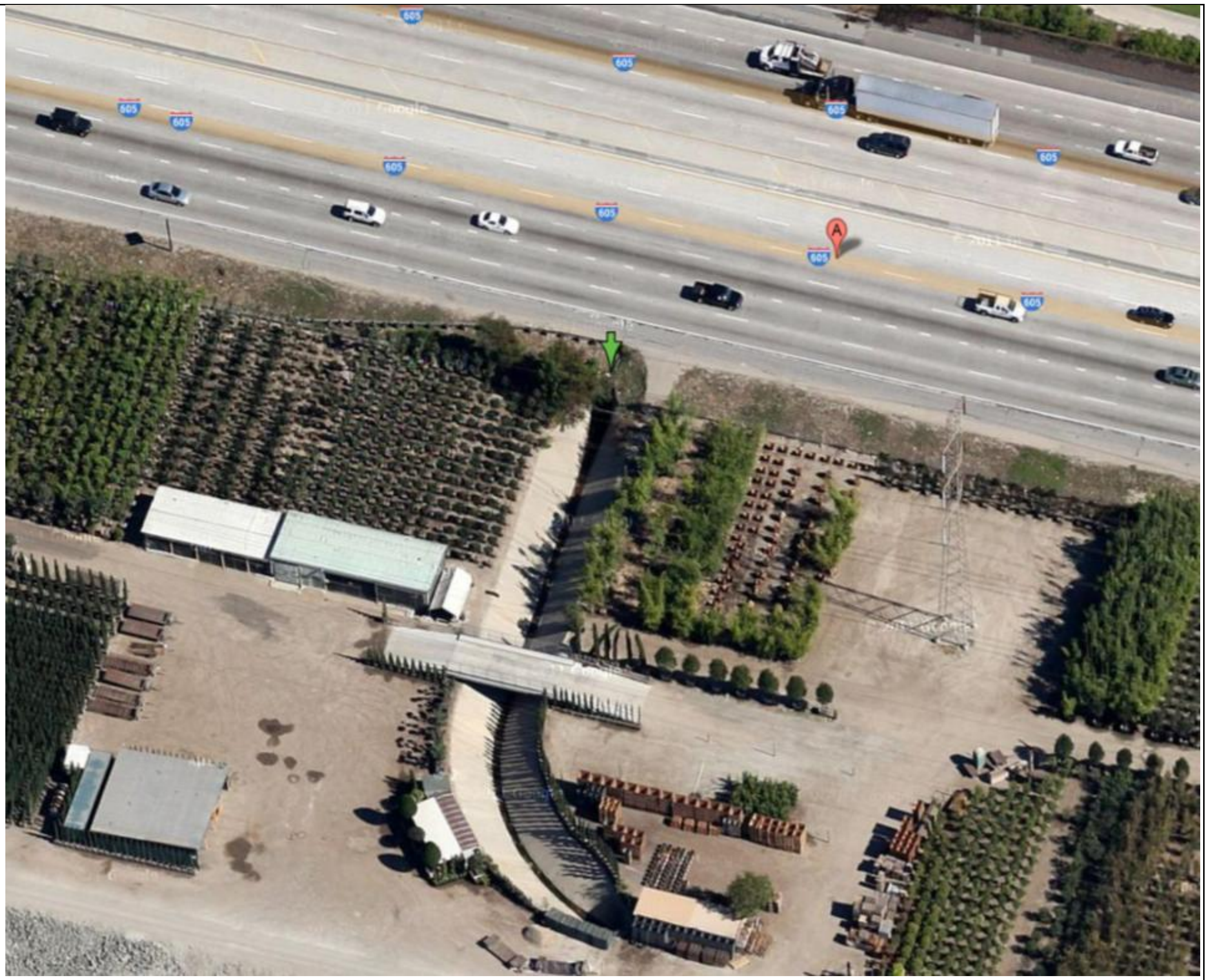
BI 1701 – Line A Aerial View

F-1.3 BI 975

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
SGR Reach 4	Baldwin Park	BI 9705	96 inches	SW Outfall	34.071568	-118.00019

General Description: New SW outfall monitoring site discharging to San Gabriel River Reach 4 downstream of the 605 Freeway.





BI 9705 Aerial View

F-2 LOS ANGELES COUNTY POTENTIAL OUTFALL SITES

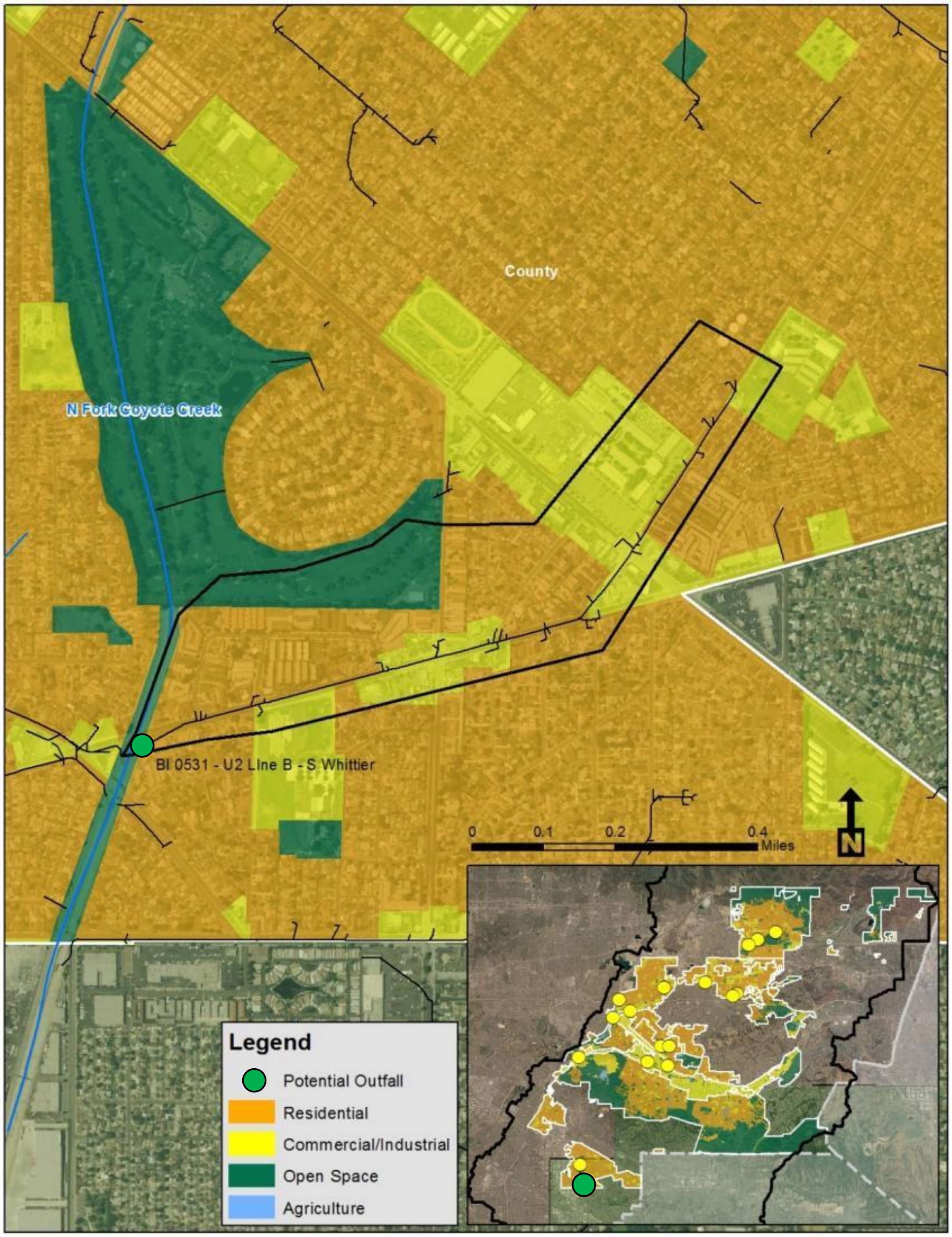
Table 2. Potential Wet Weather Outfall Monitoring Sites – Los Angeles County

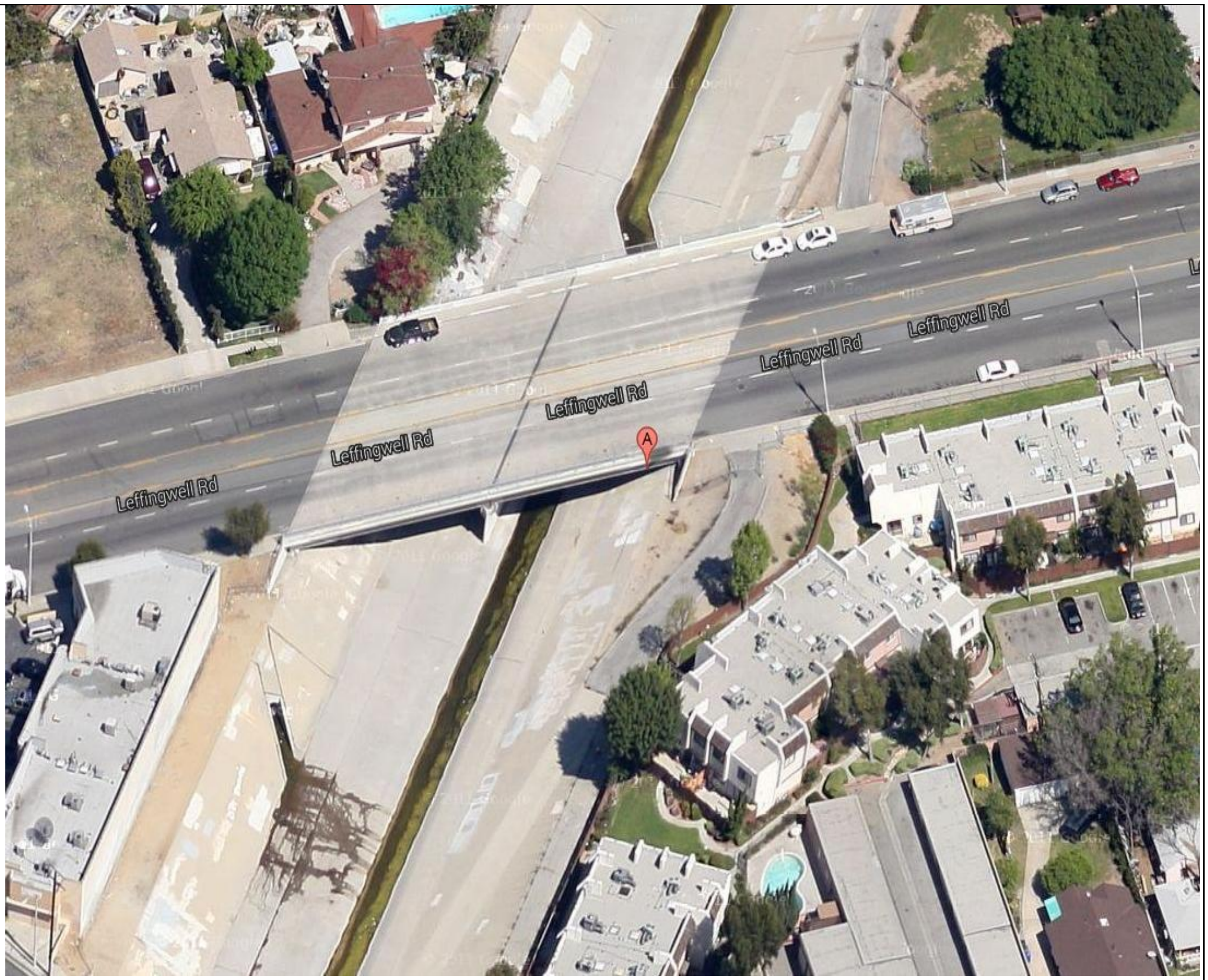
Water Body	Jurisdiction	Drain Name	Size	Shape	Material	Lat	Lon
N Fork Coyote Creek	County	BI 0531 - U2 Line B - S. Whittier	36”	Round	Reinforced Conc. Pipe	33.921058	-118.036397
N Fork Coyote Creek	County	PD 2425 - Sorenson Ave Drain	36”	Square or Rectangle	Reinforced Conc. Box	33.936115	-118.036951

F-2.1 BI 0531 – U2 Line B, South Whittier

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
N. Fork Coyote Creek	County	BI 0531 - U2 Line B - S. Whittier	36 inches	SW Outfall	33.921058	-118.036397

General Description: New SW outfall monitoring site discharging to N. Fork of Coyote Creek downstream of Leffingwell Rd.

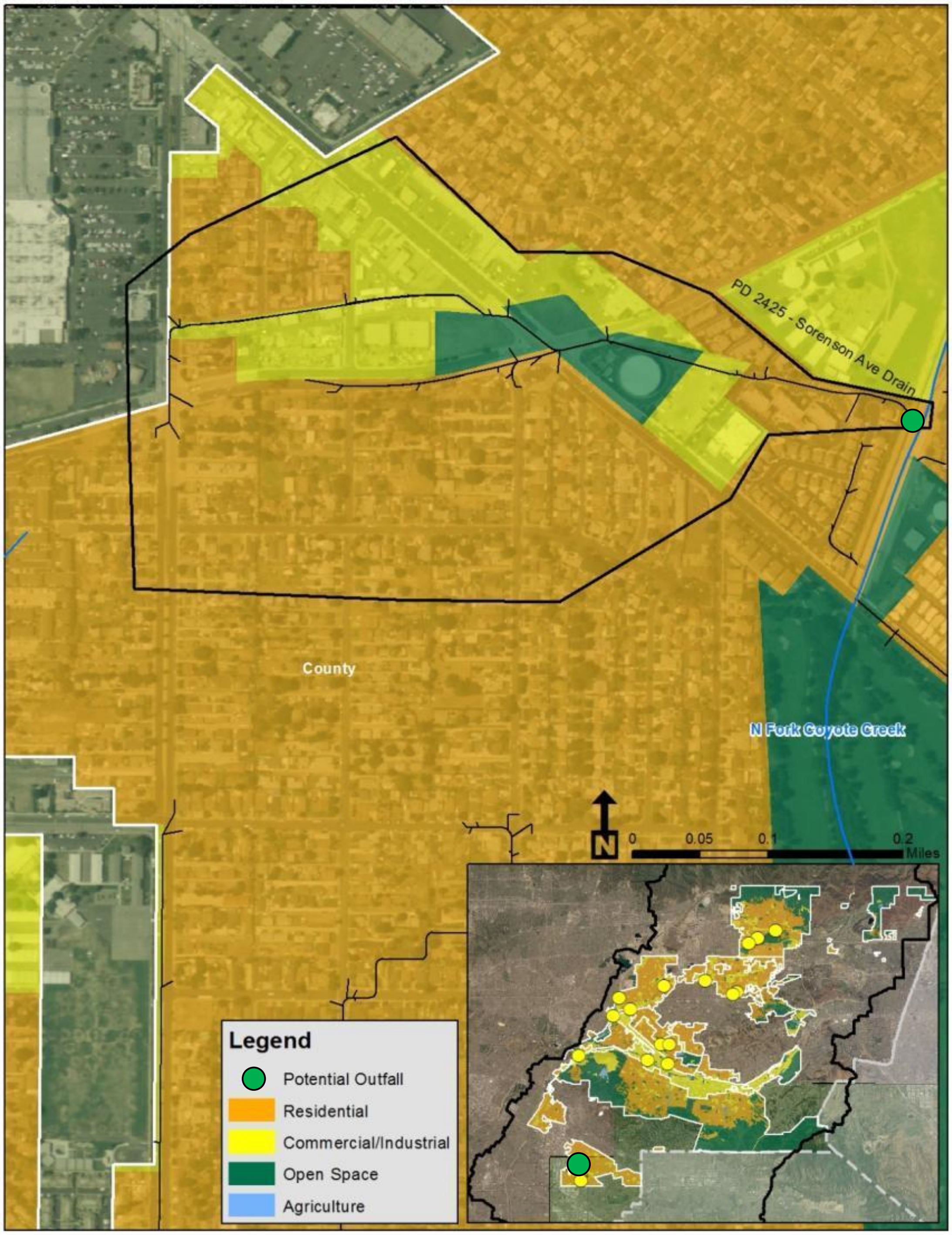




BI 0531 U2 Line B – S. Whittier Aerial View

F-2.2 PD 2425 – Sorenson Ave Drain

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
N. Fork Coyote Creek	County	PD 2425 - Sorenson Ave Drain	36 inches	SW Outfall	33.936115	-118.036951
General Description: New SW outfall monitoring site discharging to N. Fork Coyote Creek downstream of Mills Ave.						



PD 2425 – Sorenson Ave Drain Aerial View

F-3 City of Covina Potential Outfall Sites

Table 3. Potential Wet Weather Outfall Monitoring Sites – City of Covina

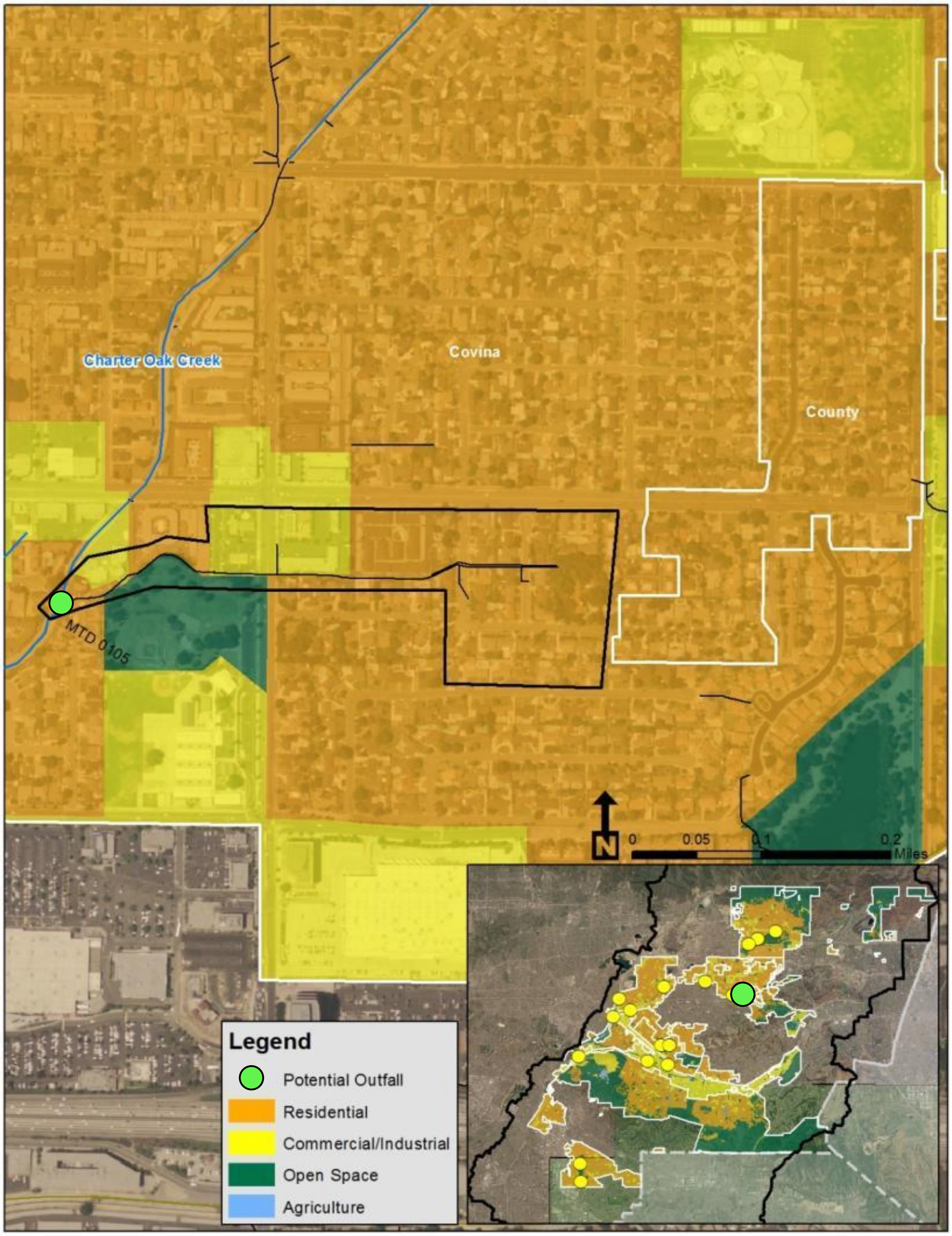
Water Body	Jurisdiction	Drain Name	Size	Shape	Material	Lat	Lon
Charter Oak Creek [1]	Covina	MTD 0105	36”	Round	Reinforced Conc. Pipe	34.077646	-117.884103
Charter Oak Creek [1, 2]	Covina	BI 0612	60”	Round	Reinforced Conc. Pipe	34.075697	-117.887446
Big Dalton Wash [2, 3]	Covina	BI 1123	81”	Round	Reinforced Conc. Pipe	34.086451	-117.915529

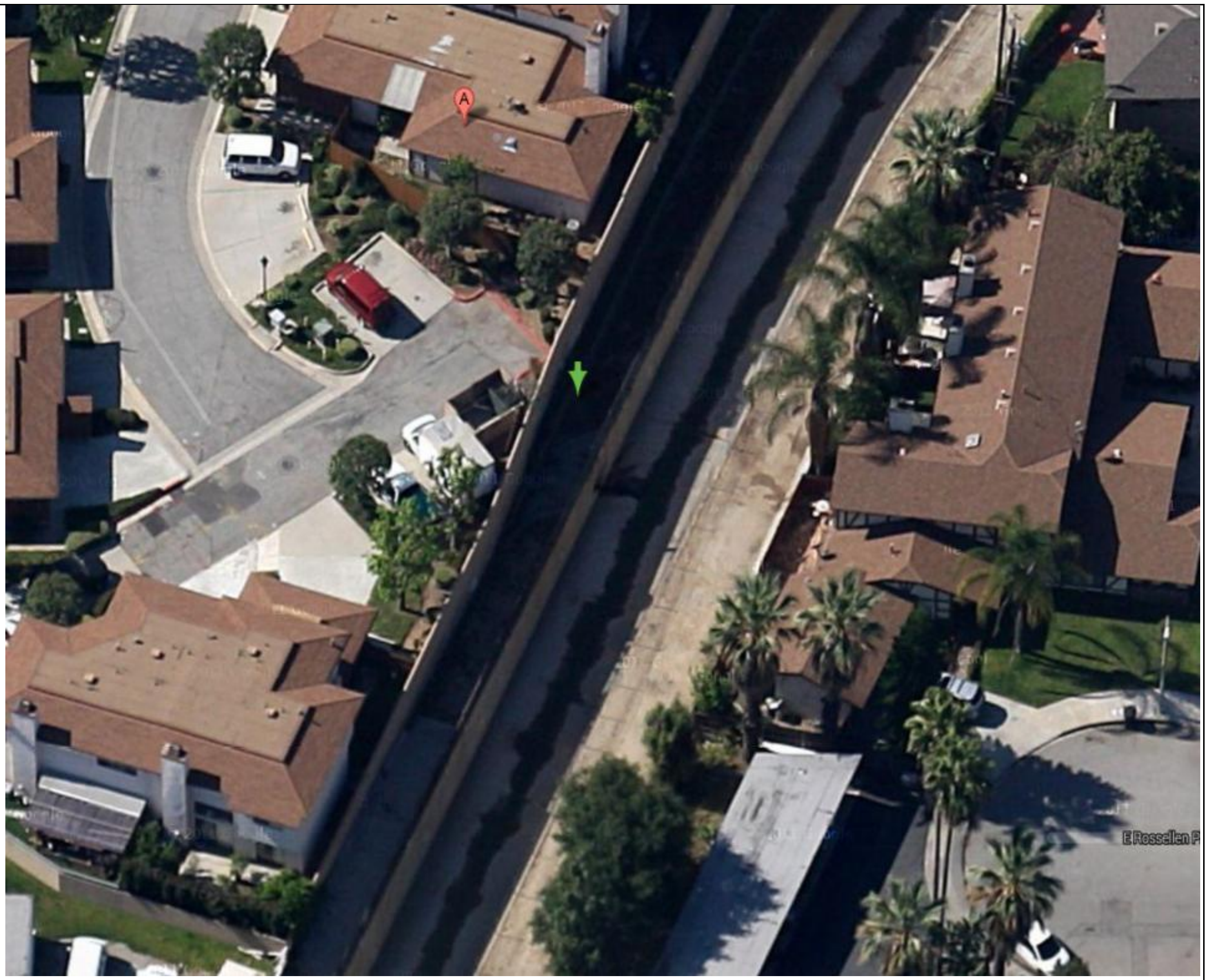
1. Tributary to Walnut Creek
2. Manhole location
3. Drain eventually discharges to Big Dalton Wash

F-3.1 MTD 0105

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Charter Oak Creek	Covina	MTD 0105	36 inches	SW Outfall	34.077646	-117.884103

General Description: New SW outfall monitoring site discharging to Charter Oak Creek' a tributary to Walnut Creek, downstream of Rowland Ave.



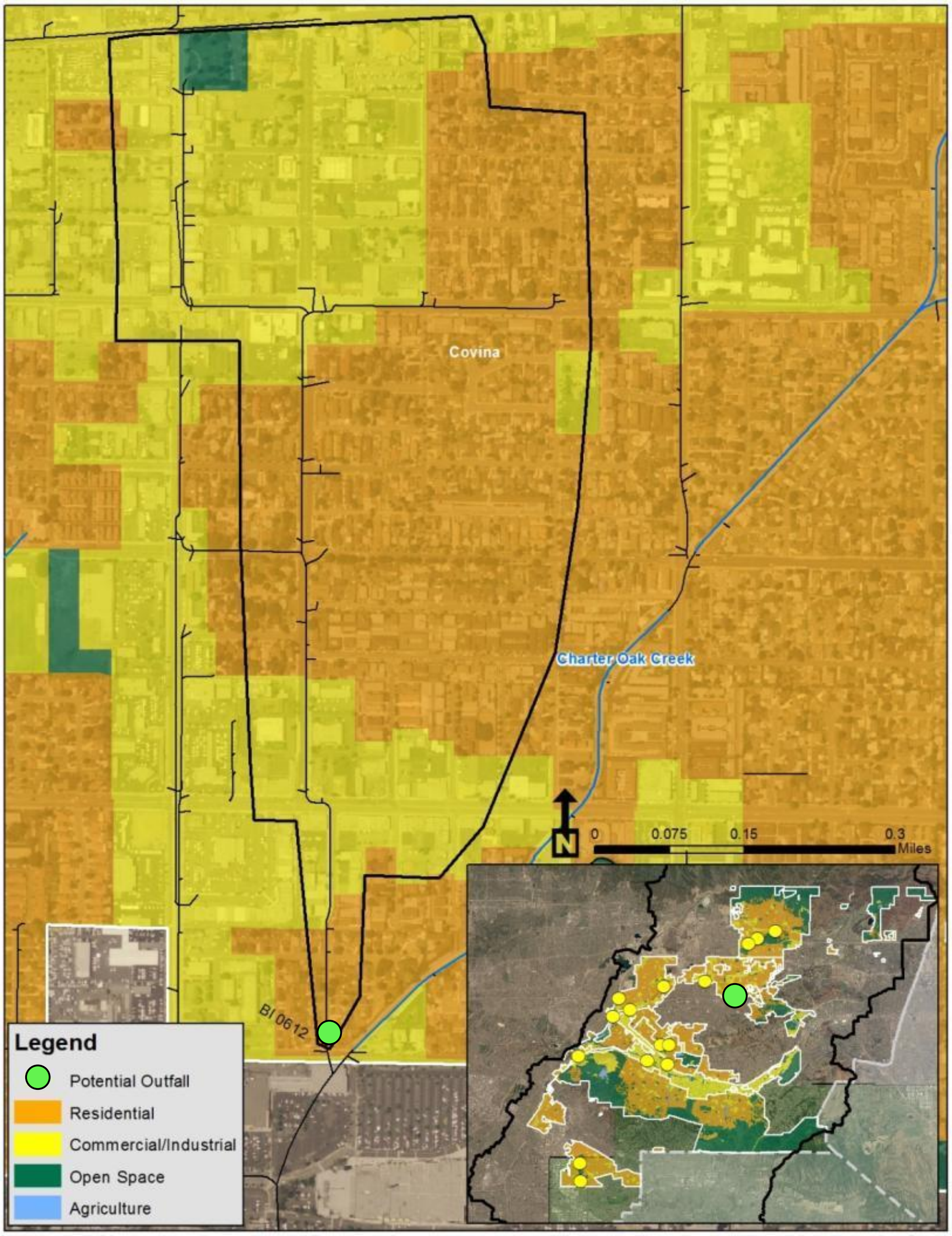


MTD 0105 Aerial View

F-3.2 BI 0612

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Charter Oak Creek	Covina	BI 0612	60 inches	SW Outfall	34.075697	-117.887446

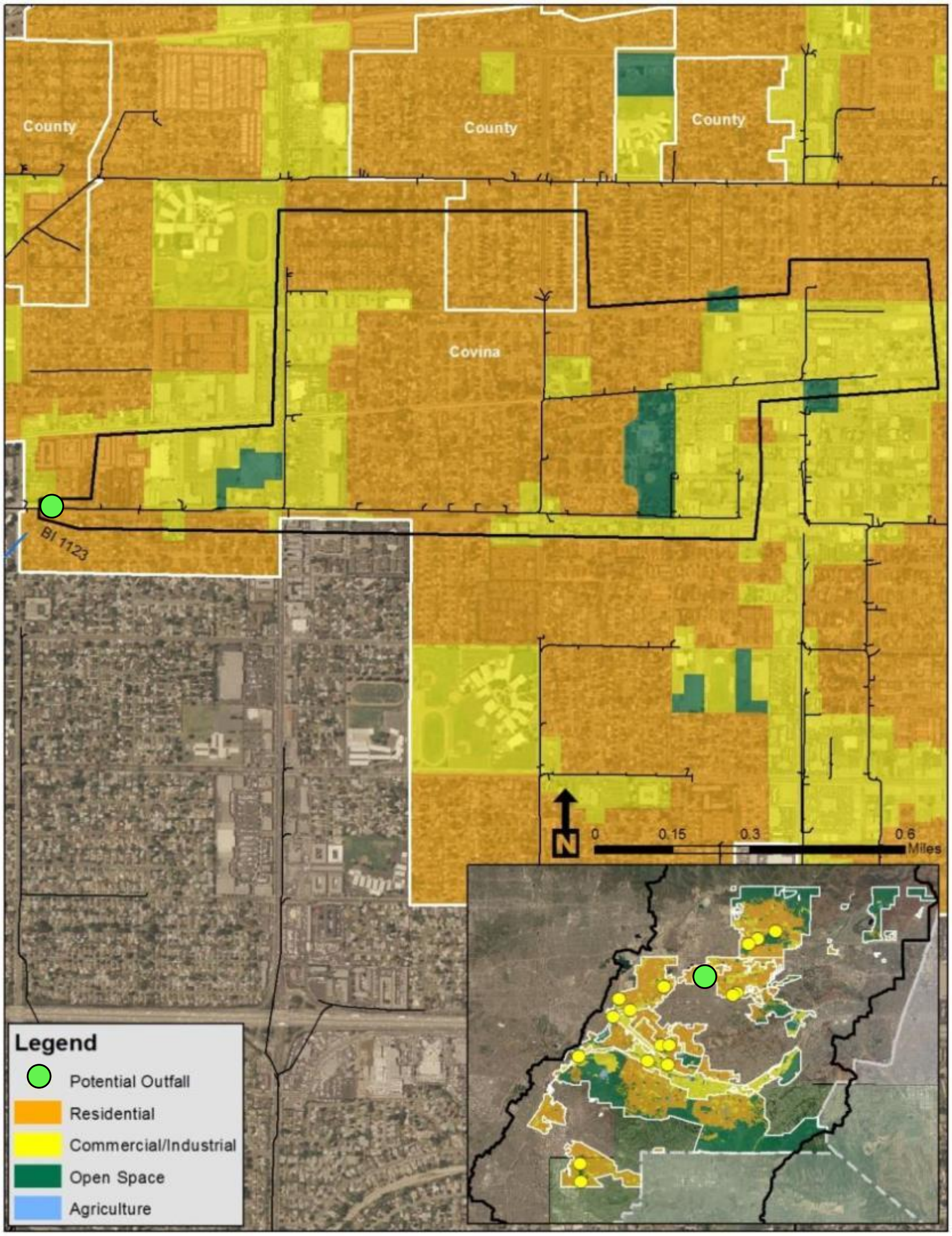
General Description: New man hole SW outfall monitoring site discharging to Charter Oak Creek' a tributary to Walnut Creek.



MTD 0105 Street View

F-3.3 BI 1123

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Big Dalton Wash	Covina	BI 1223	81 inches	SW Outfall	34.086451	-117.915529
General Description: New man hole SW outfall monitoring site discharging to Big Dalton Wash						



BI 1223 Street View

F-4 City of Industry Potential Outfall Sites

Table 4. Potential Wet Weather Outfall Monitoring Sites – City of Industry

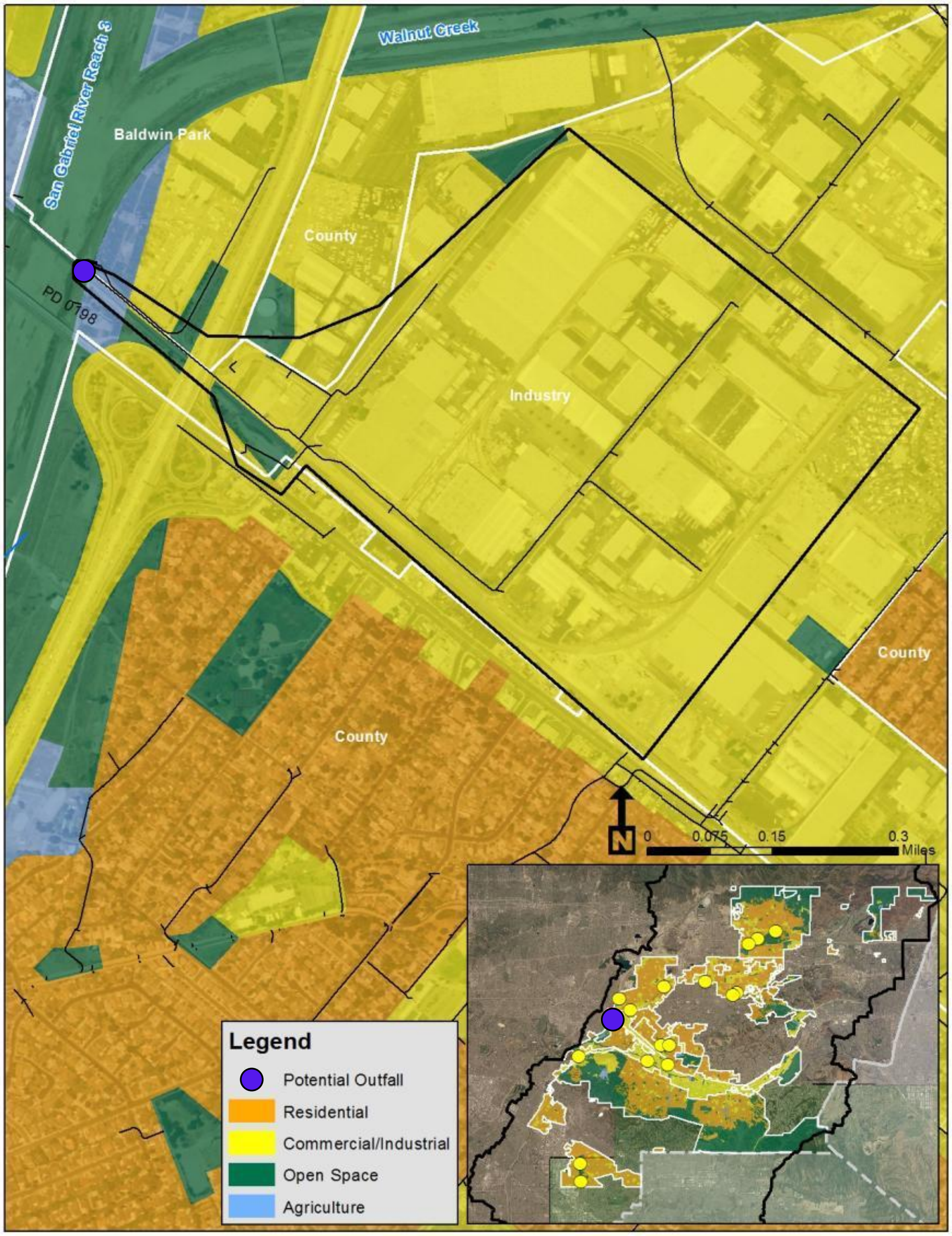
Water Body	Jurisdiction	Drain Name	Size	Shape	Material	Lat	Lon
SGR Reach 3	Industry	PD 0198	75”	Round	Reinforced Conc. Pipe	34.056824	-118.006203
SGR Reach 2 [1]	Industry	Pellissier Pl Drain	48”	Round	Reinforced Conc. Pipe	34.024104	-118.03951
SJC Reach 1	Industry	BI 4301 - Industry	72”	Round	Reinforced Conc. Pipe	34.020765	-117.971385

1. Channel eventually discharges to SGR Reach 2

F-4.1 PD 0198

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
SGR Reach 3	Industry	PD 1098	75 inches	SW Outfall	34.056824	-118.006203

General Description: New SW outfall monitoring site discharging to SGR Reach 3, just downstream of the confluence of the San Gabriel River and Walnut Creek.

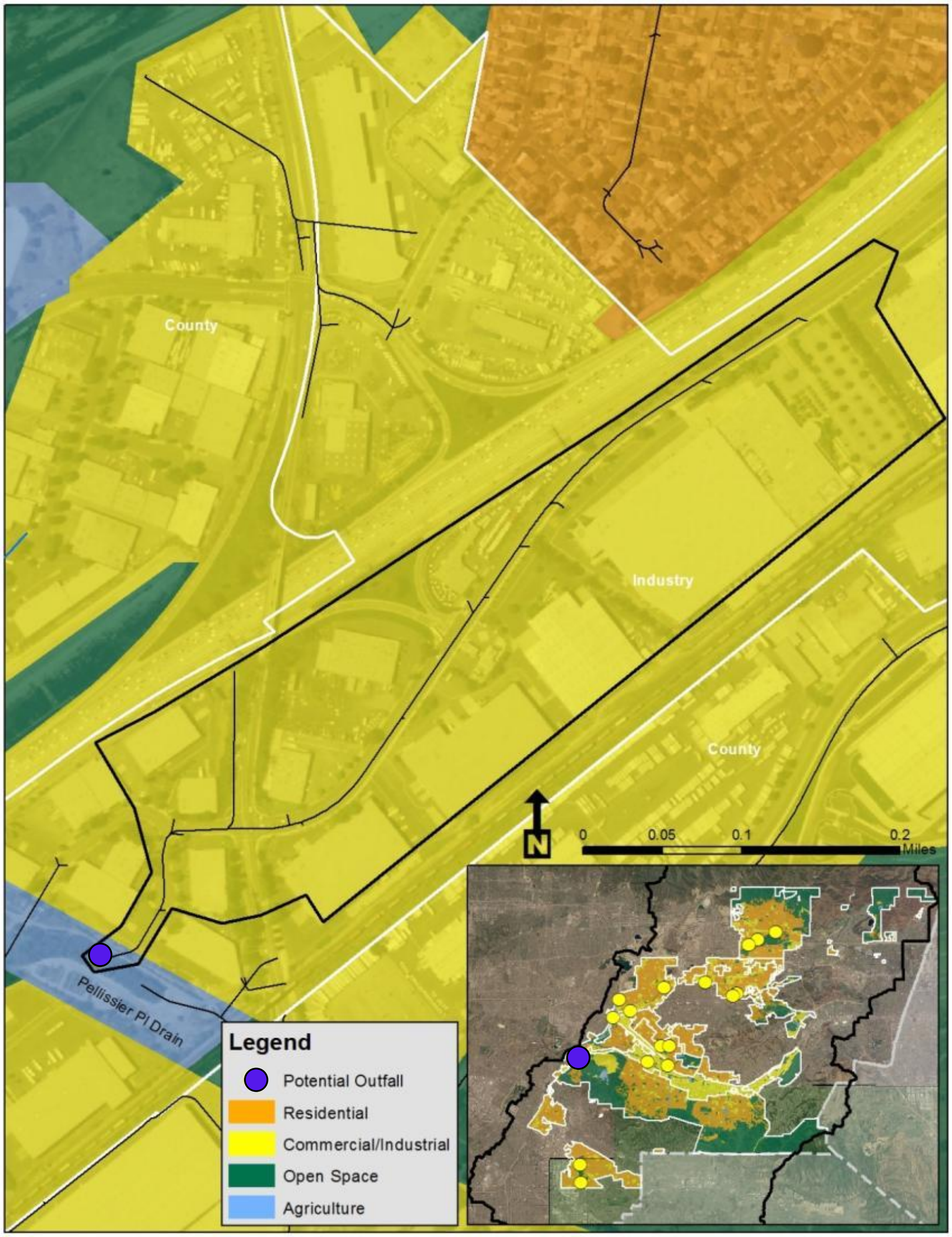


PD 0198 Aerial View

F-4.2 Pellissier Pl Drain

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
SGR Reach 2	Industry	Pellissier Pl Drian	48 inches	SW Outfall	34.024104	-118.03951

General Description: New SW outfall monitoring site discharging to SGR Reach 2' just downstream of Peck Rd.

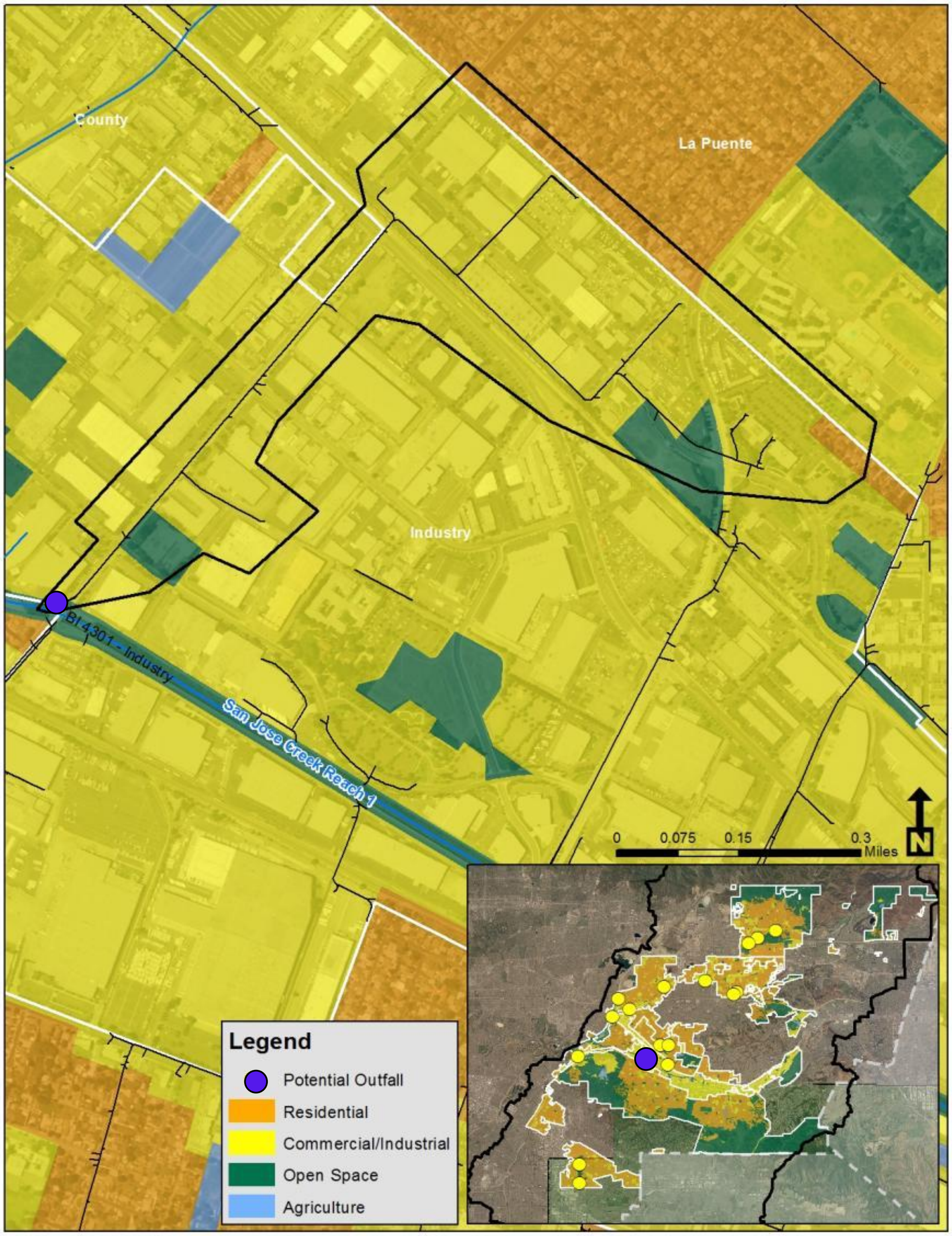


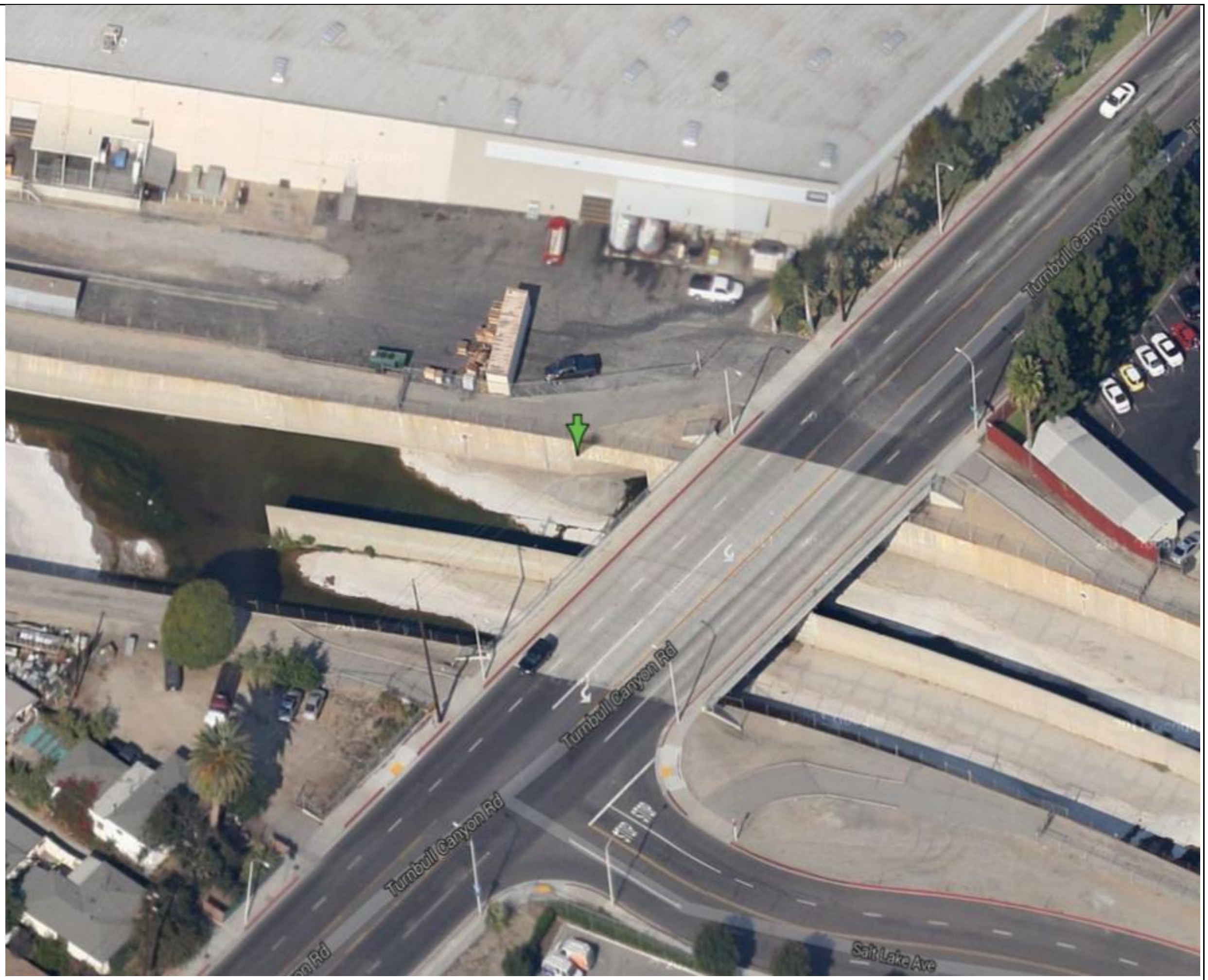
Pellissier Place Drain Aerial View

F-4.3 BI 4301 – Industry

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
SJC Reach 1	Industry	BI 4301 – Industry	72 inches	SW Outfall	34.020765	-117.971385

General Description: New SW outfall monitoring site discharging to SJC Reach 1 just downstream of Turnbull Canyon Rd.





BI 4301 - Industry Aerial View

F-5 CITY OF GLENDORA POTENTIAL OUTFALL SITES

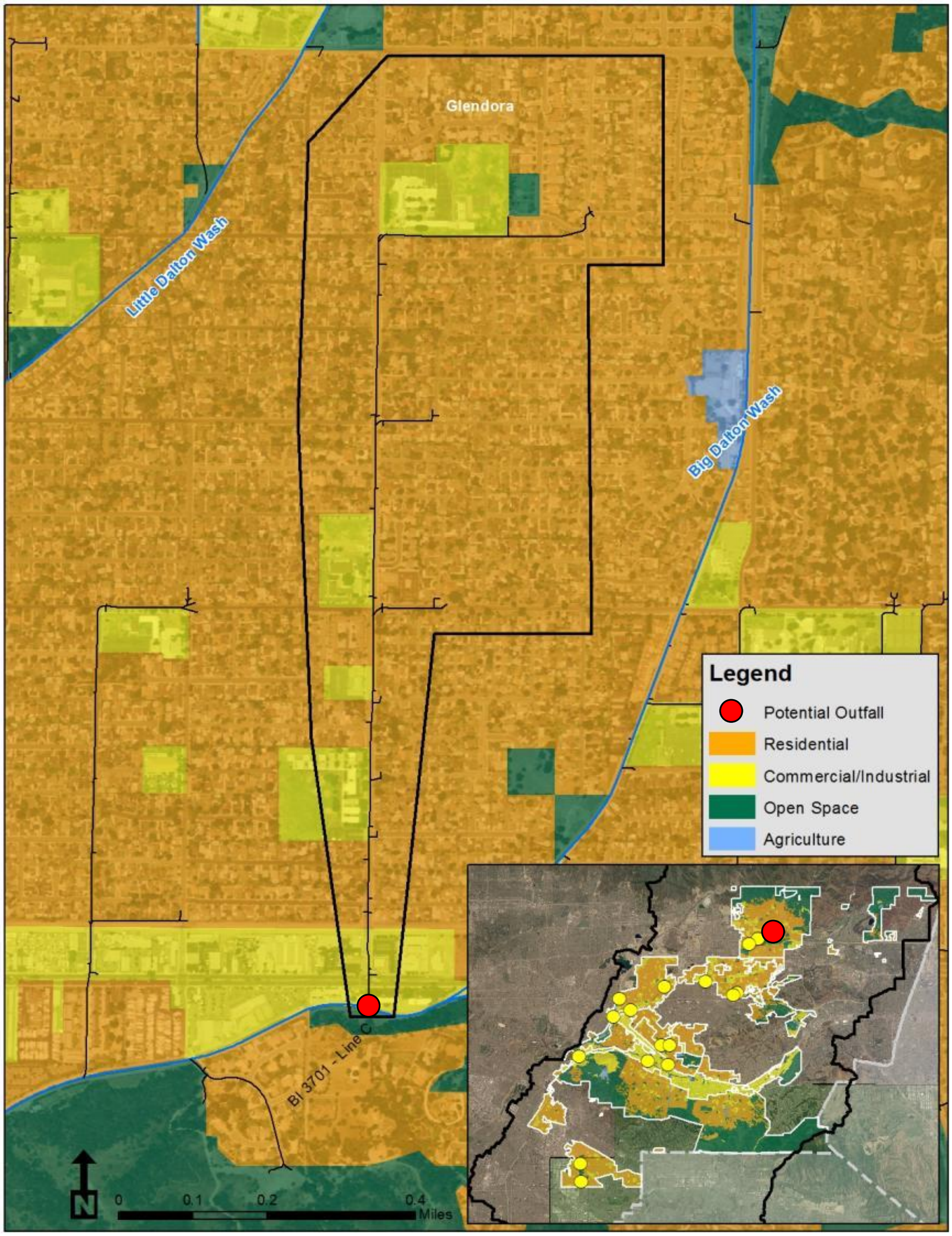
Table 5. Potential Wet Weather Outfall Monitoring Sites – Glendora

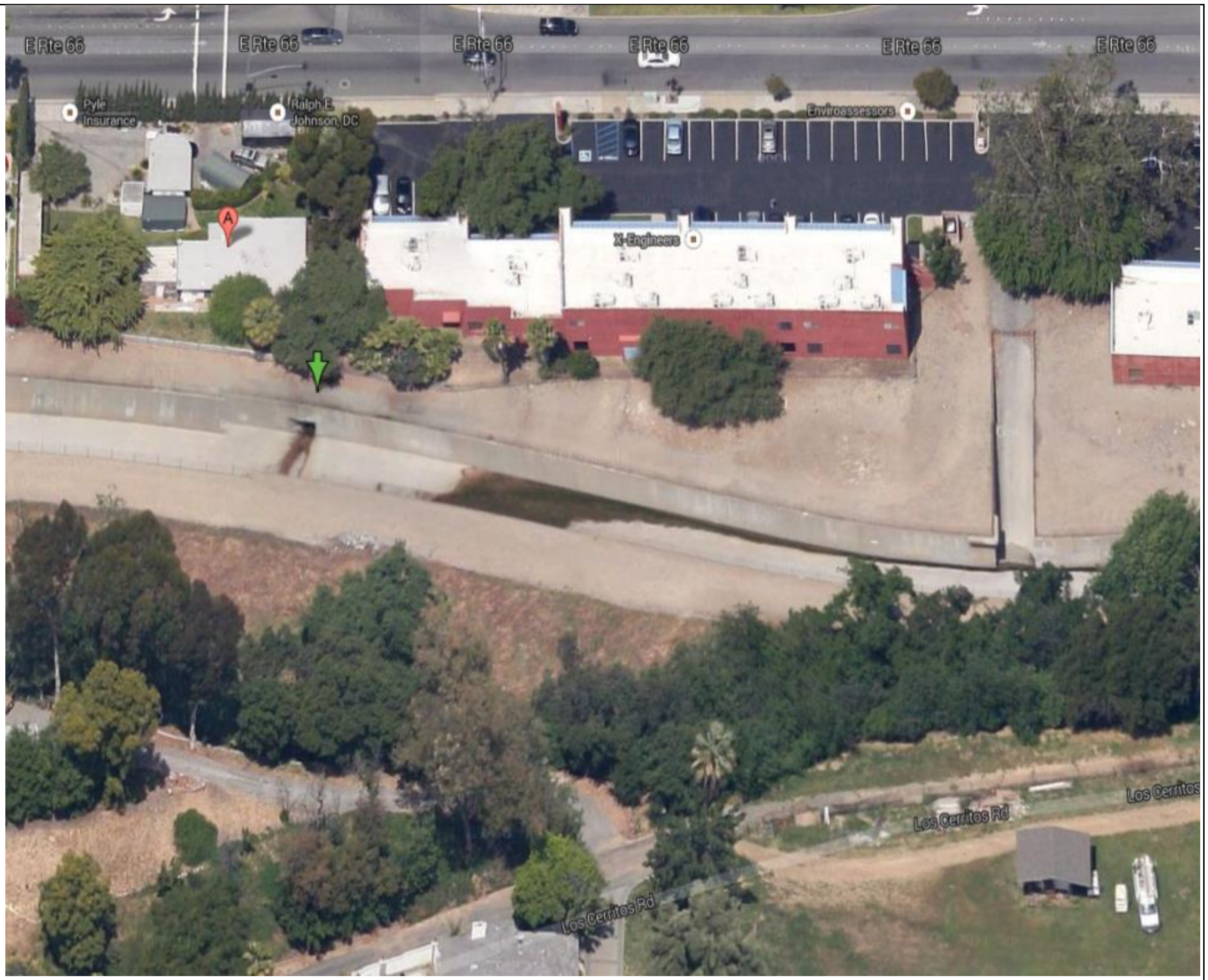
Water Body	Jurisdiction	Drain Name	Size	Shape	Material	Lat	Lon
Big Dalton Wash	Glendora	BI 3701 - Line C	60”	Round	Reinforced Conc. Pipe	34.128306	-117.846414
Big Dalton Wash	Glendora	BI 0517 - Line B	42”	Round	Reinforced Conc. Pipe	34.121922	-117.864099
Big Dalton Wash	Glendora	BI 0517 - Line A	75”	Round	Reinforced Conc. Pipe	34.117804	-117.872865

F-5.1 BI 3701 – Line C

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Big Dalton Wash	Glendora	BI 3701 – Line C	60 inches	SW Outfall	34.128306	-117.846414

General Description: New SW outfall monitoring site discharging to Big Dalton Wash just downstream of East Route 66.



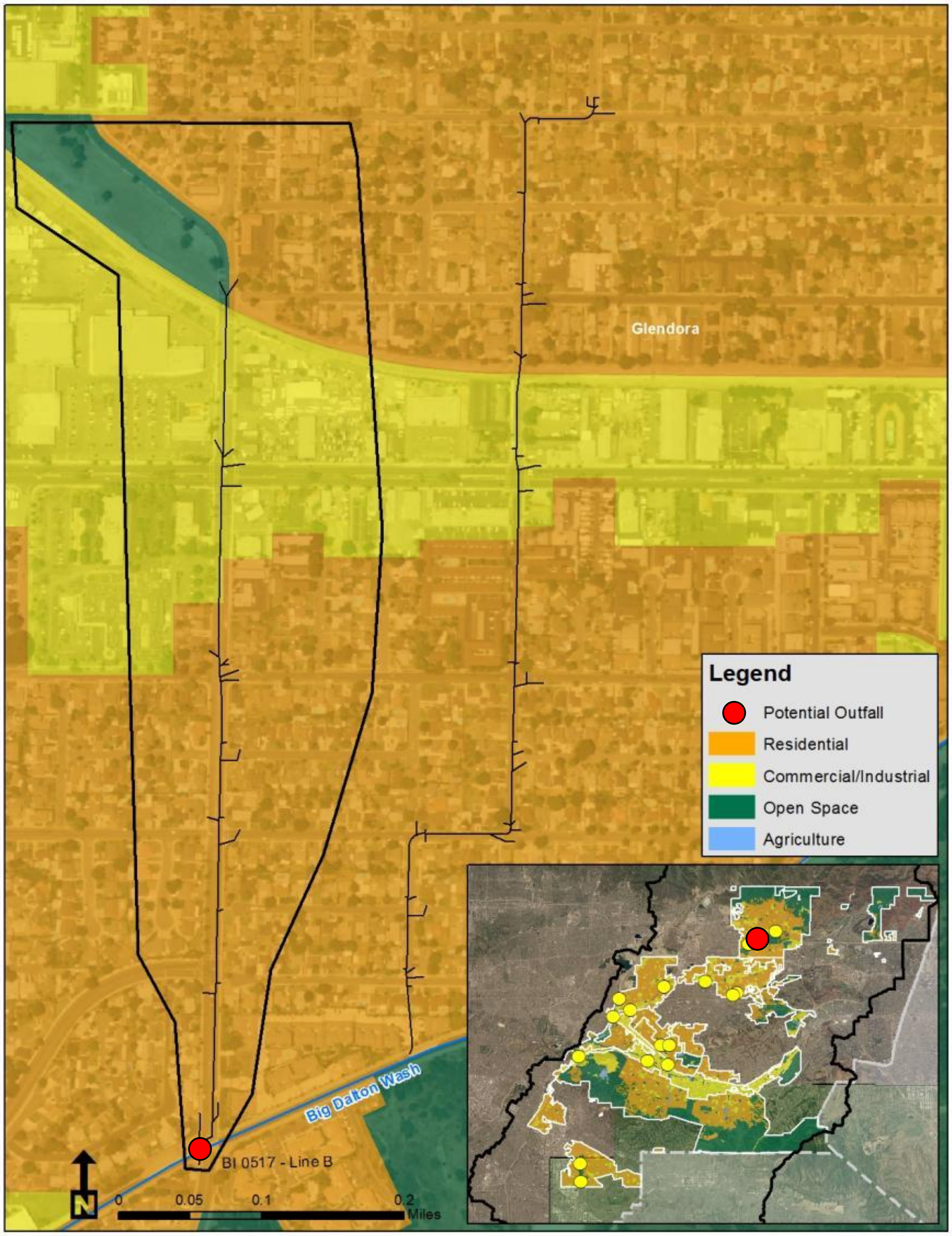


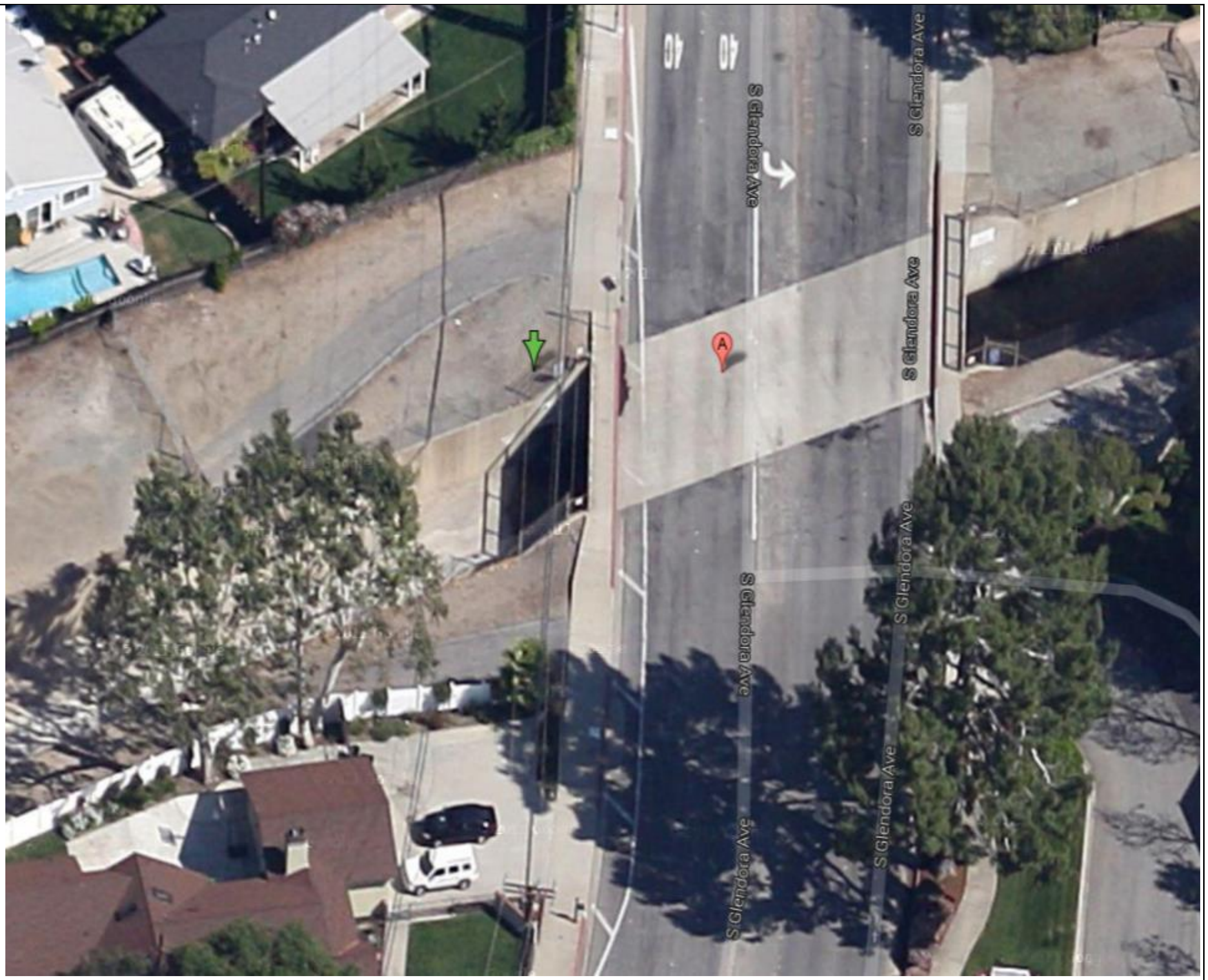
BI 3701 – Line C Aerial View

F-5.2 BI 0517 – Line B

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Big Dalton Wash	Glendora	BI 0517 - Line B	42 inches	SW Outfall	34.121922	-117.864099

General Description: New SW outfall monitoring site discharging to Big Dalton Wash just downstream of Glendora Ave.

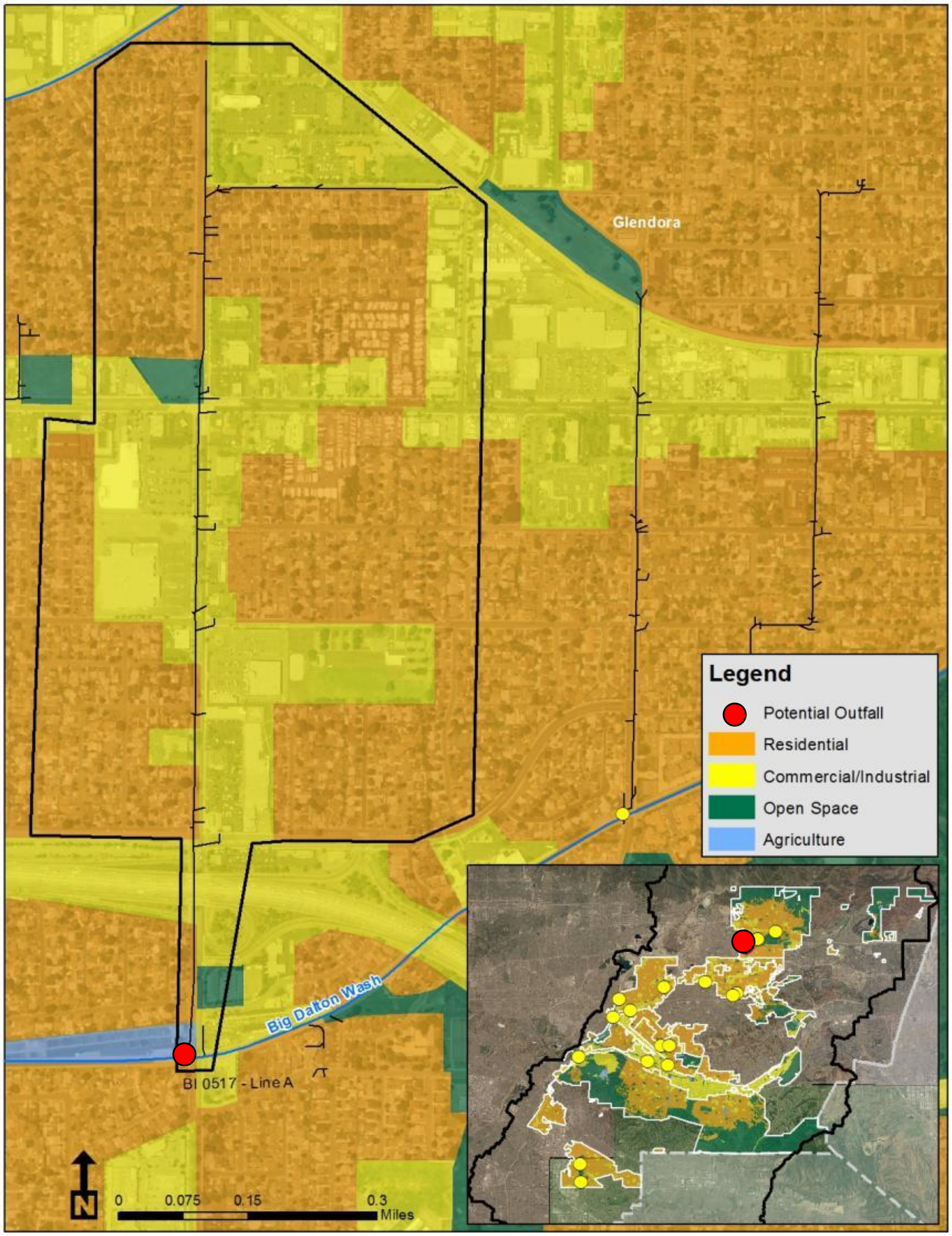


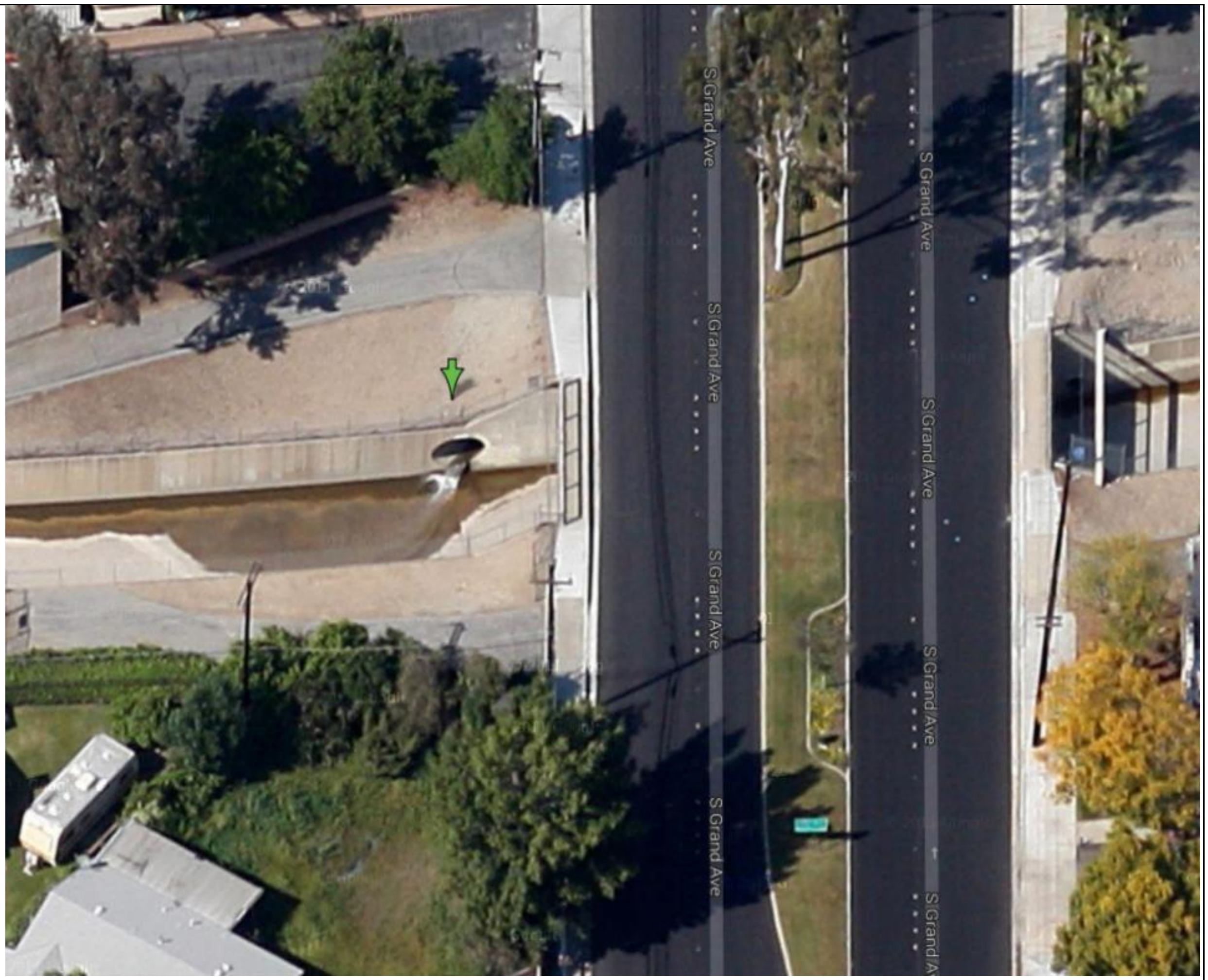


BI 0517 – Line B Aerial View

F-5.3 BI 0517 – Line A

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Big Dalton Wash	Glendora	BI 0517 - Line A	75 inches	SW Outfall	34.117804	-117.872865
General Description: New SW outfall monitoring site discharging to Big Dalton Wash just downstream of Grand Ave.						





BI 0517 – Line A Aerial View

F-6 CITY OF LA PUENTE POTENTIAL OUTFALL SITES

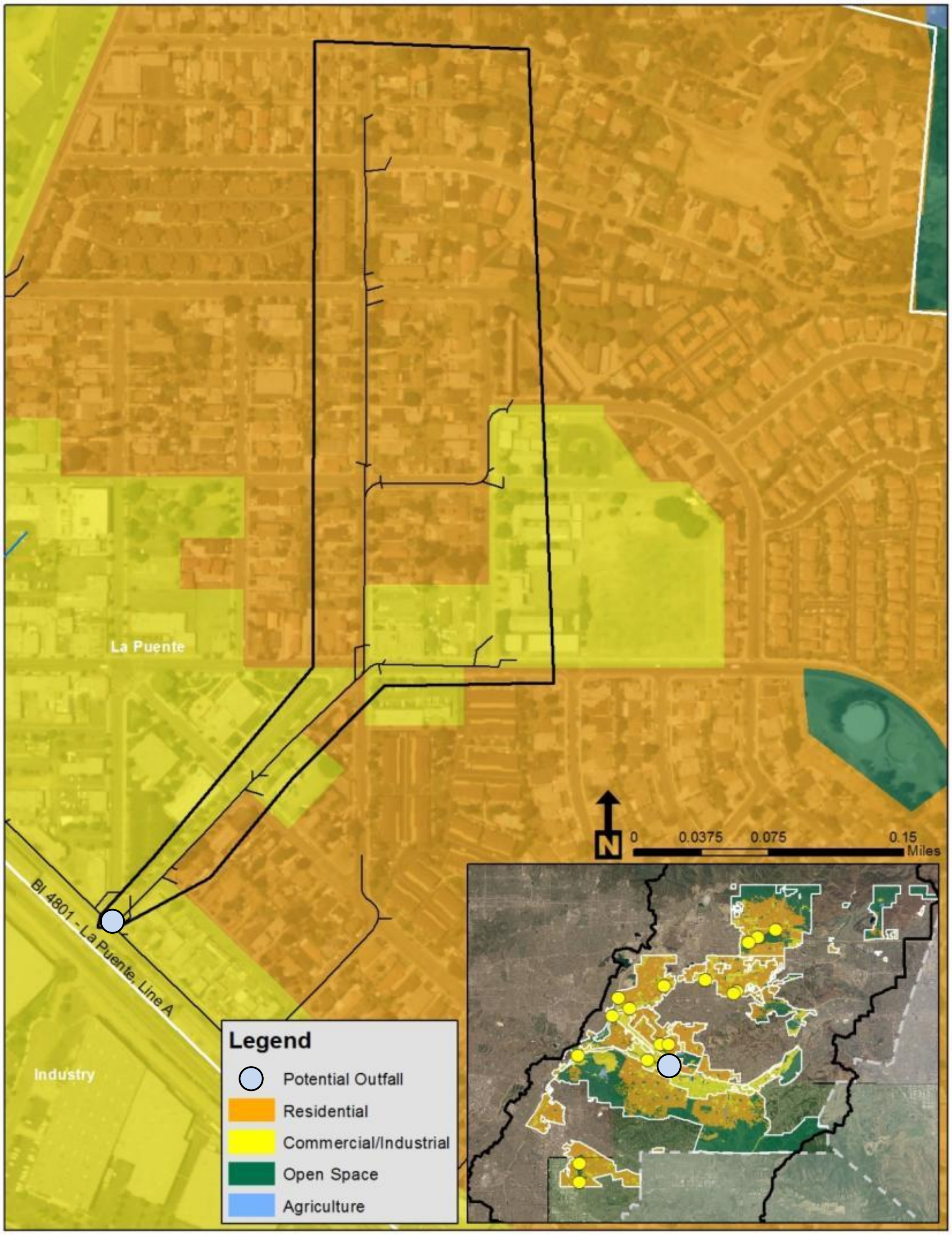
Table 6. Potential Wet Weather Outfall Monitoring Sites – City of La Puente

Water Body	Jurisdiction	Drain Name	Size	Shape	Material	Lat	Lon
SJC Reach 1 [1]	La Puente	BI 4801 - La Puente, Line A	42”	Round	Reinforced Conc. Pipe	34.018048	-117.951518
Puente Creek [2]	La Puente	BI 4801 - Line B	66”	Round	Reinforced Conc. Pipe	34.033704	-117.950301
Puente Creek	La Puente	RDD 0291	36”	Round	Reinforced Conc. Pipe	34.033697	-117.958337

1. Drain eventually discharges to San Jose Creek Reach 1
2. Drain eventually discharges to Puente Creek

F-6.1 BI 4801 – La Puente, Line A

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
SJC Reach 1	La Puente	BI 4801 – La Puente, Line A	42 inches	SW Outfall	34.018048	-117.951518
General Description: New man hole SW outfall monitoring site discharging to SJC Reach 1.						

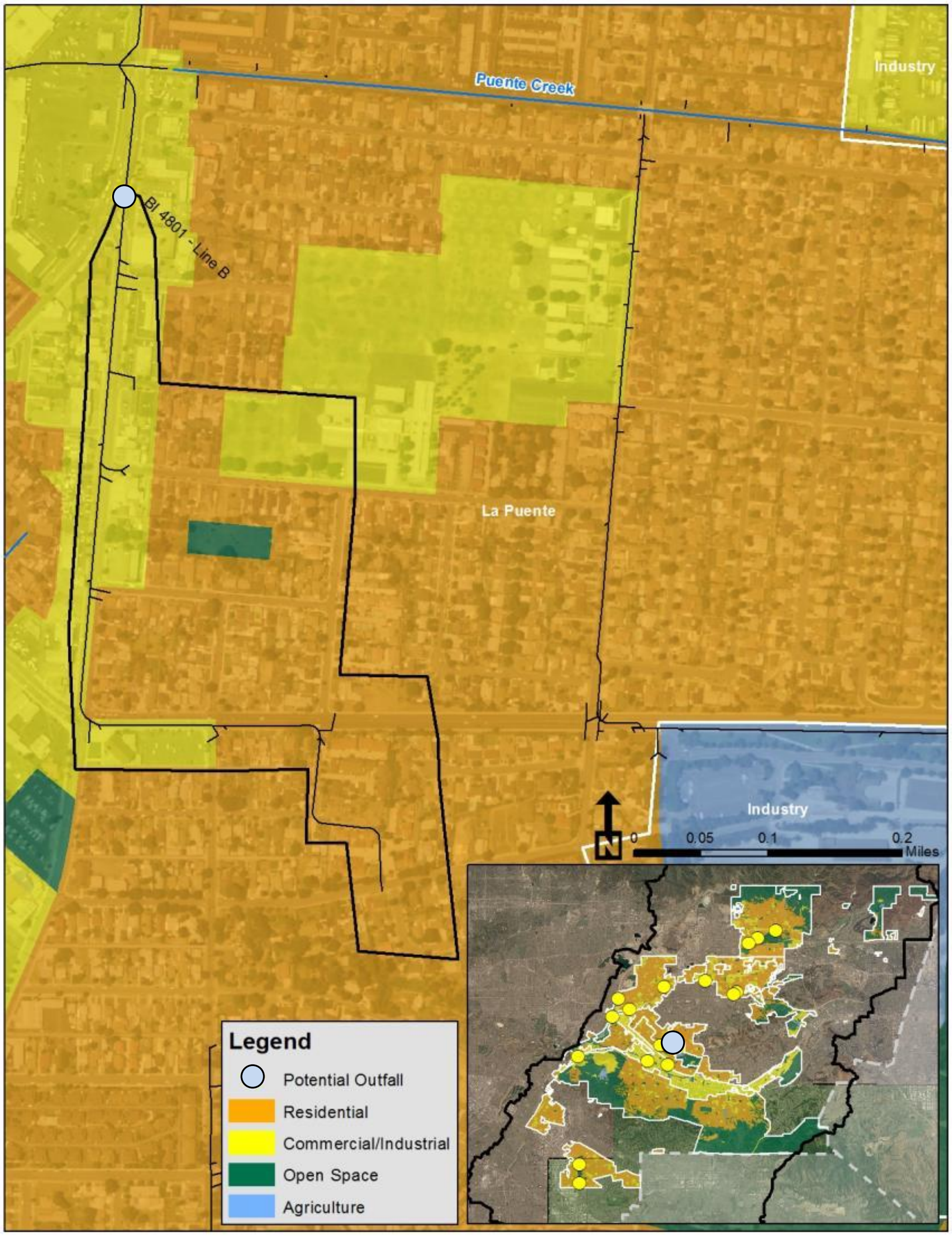


BI 4801 – La Puente, Line A Street View

F-6.2 BI 4801 – Line B

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Puente Creek	La Puente	BI 4801 – Line B	66 inches	SW Outfall	34.033704	-117.950301

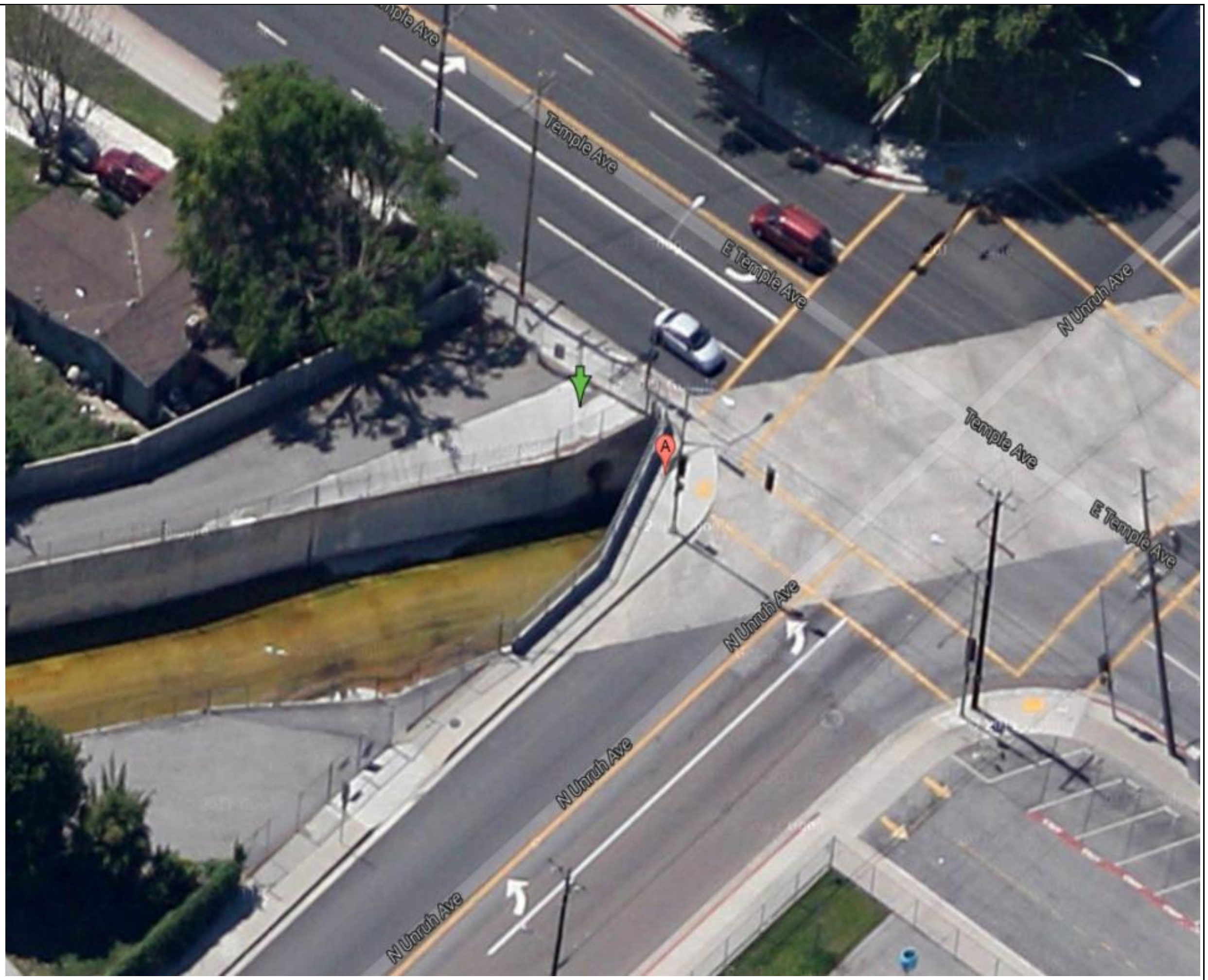
General Description: New man hole SW outfall monitoring site discharging to Puente Creek.



BI 4801 – Line B Street View

F-6.3 RDD – 0291

Water Body	Group Member	Drain Name	Size	Site Type	Latitude	Longitude
Puente Creek	La Puente	RDD 0291	36 inches	SW Outfall	34.033697	-117.958337
General Description: New SW outfall monitoring site discharging to Puente Creek just downstream of Temple Ave.						



RDD 0291 Street View